Draft
ENVIRONMENTAL ASSESSMENT

For the

Integrated Natural Resource Management Plan

Nellis Air Force Base and Nevada Test and Training Range, NV

May 2007

U.S. AIR FORCE

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ACRONYMS AND ABBREVIATIONS

LIST OF ACRONYMS

ACC	Air Combat Command
ACM	Asbestos Containing Material
AFI	Air Force Instruction
AICUZ	Air Installation Compatible Use Zone
AIRFA	American Indian Religious Freedom Act
BASH	Bird Aircraft Strike Hazard
BLM	Bureau of Land Management
BLM RPM	BLM Resource Management Plan
BLM RMP ROD	BLM RMP Record of Decision
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	Carbon Monoxide
CWA	Clean Water Act
dB	Decibel
DoD	U.S. Department of Defense
DOI	U.S. Department of the Interior
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
FLPMA	Federal Land Policy and Management Act
FONSI	Finding of No Significant Impact
INRMP	Integrated Natural Resources Management Plan
NAAQS	National Ambient Air Quality Standards
NAFB	Nellis Air Force Base
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO_2	Nitrogen Dioxide
NOAA	National Oceanic and Atmospheric Administration
NTTR RMP	NTTR Range Management Plan
O_3	Ozone
PL	Public Law
PM_{10}	Particulate Matter less than 10 microns in diameter
SO_2	Sulfur Dioxide
USAF	United States Air Force
USC	United States Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

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FINDING OF NO SIGNIFICANT IMPACT

1. Name of the Action

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN FOR NELLIS AIR FORCE BASE AND THE NEVADA TEST AND TRAINING RANGE

2. Description of the Proposed Action and Alternatives

The Integrated Natural Resources Management Plan (INRMP) provides guidance for the conservation of natural resources at NTTR and NAFB. These guidelines have been developed within the context of the military mission of NTTR and NAFB. A primary goal of this INRMP is to sustain military readiness while maintaining ecosystem integrity and dynamics on NAFB and NTTR. The Proposed Action provides guidance to establish mission actions that minimize impacts to natural resources at NAFB and NTTR as much as practicable. Proposed surveys and studies would require funding by U.S. Air Force. Alternatives to the proposed action include Alternative A and the No Action Alternative. Alternative A would be to operate NTTR and NAFB with no INRMP guidance, but adopting the NTTR Range Management Plan, BLM Resource Management Plan and the U.S. Fish and Wildlife Service Desert National Wildlife Range Comprehensive Conservation Plan when it is approved. The No Action Alternative is to continue operating under the current INRMP with no improvements as suggested by the revised INRMP.

3. Summary of Environmental Resources and Impacts.

Implementation of the proposed action would have no significant impacts on land use; air quality; water resources; safety; hazardous materials/hazardous waste; solid waste; biological resources; cultural resources; geology and soils, and socioeconomics. The No Action Alternative and Alternative A have the potential to impact the environment by not providing a comprehensive plan that identifies sensitive natural resources before potential impacts by the mission occur. It was determined that a lack of pro-active natural resource management by the USAF could result in degradation of the range vegetation and wetlands, riparian plant communities, and plant communities associated with seeps and springs.

4. Conclusion

Pursuant to the Council on Environmental Quality (CEQ) Regulations (40 CFR, Parts 1500 - 1508) implementing procedural provisions of the *National Environmental Policy Act* of 1969 (PL 91-190, 42 USC 4321-4347), as amended, and 32 CFR 989, which implements the Environmental Impact Analysis Process (EIAP) for Air Force actions, the United States Air Force at NAFB explored and analyzed the potential environmental impacts caused by the proposed revision of the INRMP in this EA. Based on the findings and conclusions of this EA, an Environmental Impact Statement is not required.

MARIA J. DOWLING
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Vice Commander, 99th Air Base Wing

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ENVIRONMENTAL ASSESSMENT

Integrated Natural Resources Management Plan
for
Nellis Air Force Base
and the
Nevada Test and Training Range

May 2007

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EXECUTIVE SUMMARY

INTEGRATED NATURAL RESOURCES MANAGEMENT PLAN FOR NELLIS AIR FORCE BASE AND THE NEVADA TEST AND TRAINING RANGE

The United States (US) Air Force at Nellis Air Force Base (NAFB) has prepared this Environmental Assessment to comply with the *National Environmental Policy Act* of 1969, as amended. This document evaluates the potential environmental impacts of activities associated with the implementation of the integrated natural resources management plan (INRMP) for NAFB and the Nevada Test and Training Range (NTTR).

The Proposed Action provides guidance for the conservation of natural resources at NTTR and NAFB. These guidelines have been developed within the context of the military mission of NTTR and NAFB. A primary goal of this INRMP is to sustain military readiness while maintaining ecosystem integrity and dynamics on NAFB and NTTR. The Proposed Action provides guidance to establish mission actions that minimize impacts to natural resources at NAFB and NTTR as much as practicable. Proposed surveys and studies would require funding by ACC and USAF HQ. NAFB will make every effort to obtain funding, but lack of funding would result in no action on some of the proposed surveys and studies. Alternatives to the proposed action include Alternative A and the No Action Alternative. NTTR and NAFB would still be subject to other federal rules and guidelines such as the Endangered Species Act (ESA), Section 404 of the Clean Water Act, the National Environmental Policy Act (NEPA), and others under the two alternatives. Alternative A would be to operate NTTR and NAFB with no INRMP guidance, but adopting the NTTR Range Management Plan, BLM Resource Management Plan and the U.S. Fish and Wildlife Desert National Wildlife Range Comprehensive Conservation Plan when it is approved. Compared to the Proposed Action, Alternative A would not:

- Develop a natural resource database.
- Provide additional guidance for rare plant conservation.
- Include additional surveys to update natural resources data for NTTR.

The No Action Alternative is to continue operating under the current INRMP with no improvements as suggested by the revised INRMP. Compared to the Proposed Action, the No Action Alternative would not:

- Develop a natural resource database.
- Provide additional guidance for rare plant conservation
- Provide details on specific natural resource management guidelines
- Propose funding for future projects.

Based upon the nature of the activities that would occur under the proposed action and alternative actions, NAFB environmental program managers determined that the following resources could be affected and should be analyzed for impacts: land use; air quality; water resources; safety; hazardous materials/hazardous waste; solid waste; biological resources; cultural resources; geology and soils including Environmental Restoration Program sites; and socioeconomics. The existing conditions were evaluated and documented as the basis for determining the environmental consequences.

The environmental consequences of the proposed action and its alternatives were analyzed and no significant impacts to human health or the natural and cultural environment, now or in the foreseeable future, were found. These conclusions were the basis for the decision to issue a Finding of No Significant Impact in accordance with the Council on Environmental Quality Regulations (40 CFR, Parts 1500 -1508), which implements the procedural provisions of the *National Environmental Policy Act* of 1969 (PL 91-190, 42 USC 4321-4347), as

amended, and 32 CFR 989, which implements the Environmental Impact Analysis Process (EIAP) for Air Force actions.

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1.0 PURPOSE AND NEED FOR PROPOSED ACTION

Nellis Air Force Base (NAFB) has prepared this Environmental Assessment (EA) to comply with the *National Environmental Policy Act* (NEPA) of 1969 (PL 91-190; 42 USC 4321-4347), as amended. Preparation of this EA followed regulations and instructions established in 32 CFR Part 989, *Environmental Impact Analysis Process* (EIAP) for the US Air Force, and 40 CFR 1500 – 1508, *Council on Environmental Quality* (CEQ). This EA evaluates the potential environmental impacts of activities associated with the implementation of the INRMP for NAFB and NTTR.

1.1 Purpose and Need

The NAFB 99th Civil Engineer Squadron, Environmental Flight, Natural and Cultural Resources Section (99CES/CEV) has been directed by Air Combat Command (ACC) and the Department of Defense (DOD) to prepare an Integrated Natural Resources Management Plan (INRMP). A primary goal of this INRMP is to sustain military readiness while maintaining ecosystem integrity and dynamics on NAFB and NTTR. Maintaining ecosystem integrity promotes good stewardship by supporting existing biodiversity, ensuring sustainable use of the installation, and minimizing management costs and efforts. Ecosystem management on NAFB and NTTR is a goal-driven program that supports present and future military mission requirements while managing natural and cultural resources and supporting ecosystem integrity. Ecosystem management considers the environment as a complex system functioning as a whole, not as a collection of parts, and recognizes that people and their social and economic needs are a part of the whole. The INRMP incorporates natural resource management policies, available regulatory guidance documents, and current natural resource data for NAFB and the NTTR to produce a practical guideline document that recognizes and respects the goals and objectives of the Nellis mission while conserving the natural resources of both areas. The INRMP provides practical guidelines to assist natural resources managers in making proper decisions in support of mission operations and management that respects the integrity of the natural environment while adhering to the mission and providing a sustainable environment for mission activities. In summary, the primary goal of NTTR and NAFB is to support the military mission. The primary goal of the INRMP is to offer guidelines for the proper management of natural resources on NTTR and NAFB in a manner that supports the military mission.

NAFB and NTTR together comprise about 3 million acres of land in southern Nevada. This land is used to provide a safe and secure location to test equipment and train military personnel in a manner to meet nationally directed missions. In 1999, the Department of the Air Force finalized the Legislative Environmental Impact Statement for Renewal of the NAFB Range Land Withdrawal. This allowed use of approximately 3 million acres by the Air Force and other military personnel for testing and training. NTTR currently supports ecosystems that play a significant role in the Great Basin and Mojave Desert. The majority of these ecoregions are not impacted at NTTR with only 15% of the land area being disturbed by mission activities. Because public access is limited, ecosystems on NTTR are not impacted by the general public as is observed on BLM lands surrounding NTTR. Thus, NTTR provides a relatively well-enclosed area in which ecosystems can develop with minimal disturbance. NTTR has thus become a haven for many species of concern and an excellent environment to observe natural processes relatively unhampered by man's activities.

As the steward of land associated with NAFB and NTTR, the Air Force takes its role as a natural resource manager very seriously. Environmental impacts are considered in implementing mission actions on NAFB and NTTR.

Under the Sikes Act, military installations are required to provide for the conservation and rehabilitation of natural resources on those installations. The Sikes Act requires that each base develop an integrated natural resource management plan (INRMP) in such a manner that there is no net loss in the capability of military installation lands to support the military mission of the installation. The Sikes Act and DoD Number 4715.1E also require that this plan be prepared as a coordinated and cooperative endeavor with the 98th RANW, the Secretary of the Department of Interior (delegated to U.S. Fish and Wildlife Service) and the governor of Nevada (delegated to NDOW). The INRMP is prepared under the authority of AFI 32-7064, which provides the Air Force with the authority to establish natural resource management plans at Department of Defense (DOD) installations. The INRMP identifies resources to be managed at NTTR and NAFB, recommends methods to minimize impacts to those resources, and provides resource management guidance for NTTR and NAFB mission planners. Natural resource management guidelines are definitely needed to allow for proper conservation of natural resources on NTTR and NAFB.

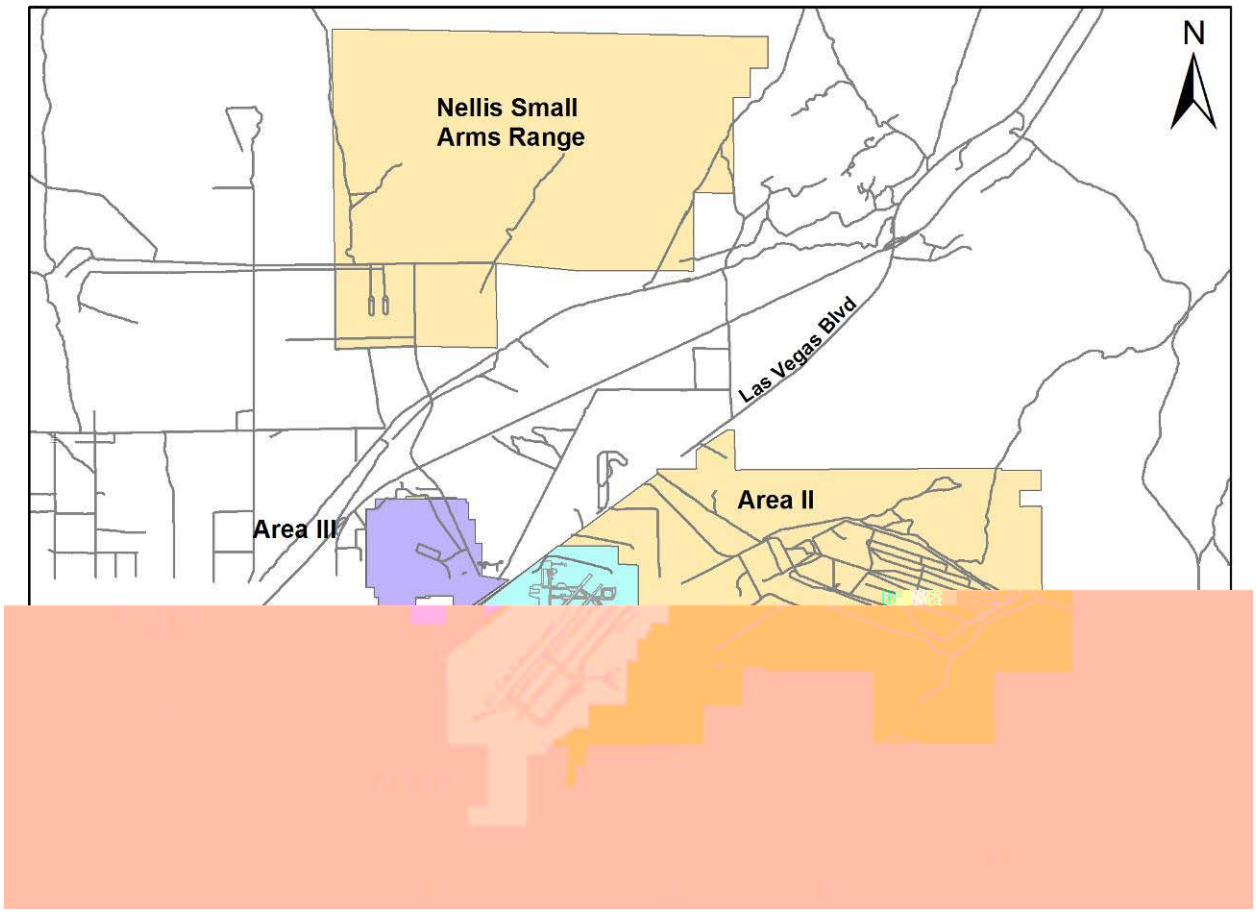
1.2 Location of Proposed Action

NAFB is located northeast of the City of North Las Vegas in Clark County, Nevada. It occupies approximately 14,163 acres adjacent to the metropolitan area. The approximately 10,623-acre Nellis Small Arms Range is 3 miles northwest of NAFB on Range Road. The average elevation of NAFB is approximately 1,900 feet above mean sea level (MSL). NAFB is divided into three areas. Area I includes the NAFB facilities southeast of Las Vegas Boulevard. Aircraft facilities, administrative buildings, residential housing, recreation facilities, and personnel services are located here. Area II is in the northeast portion of NAFB and contains the 820th RED HORSE squadron, Nellis Gun Club, 896th Munitions Squadron, and the largest above-ground weapons storage complex in the U.S. Area III contains NAFB facilities located northwest of Las Vegas Boulevard. It includes residences, the Mike O'Callaghan Federal Hospital, administrative areas, and industrial facilities. The Small Arms Range and the Desert Wells Annex, 0.7 km west of the main gate on Craig Road, are also managed by NAFB (Figure 1-1). The elevation of the Small Arms Range averages from 2100 ft. to 3600 feet MSL.

NTTR

The NTTR is an expansive area, covering approximately 3 million acres of federally-owned lands that were withdrawn from DoI-managed lands for military use under Public Law 106-65. NTTR is a unique range area because it has flying weather that is excellent year-round and it contains more than 1,600 bombable targets. Because of its size, NTTR easily provides satisfactory security and safety buffers. There is no other range like it anywhere in the world.

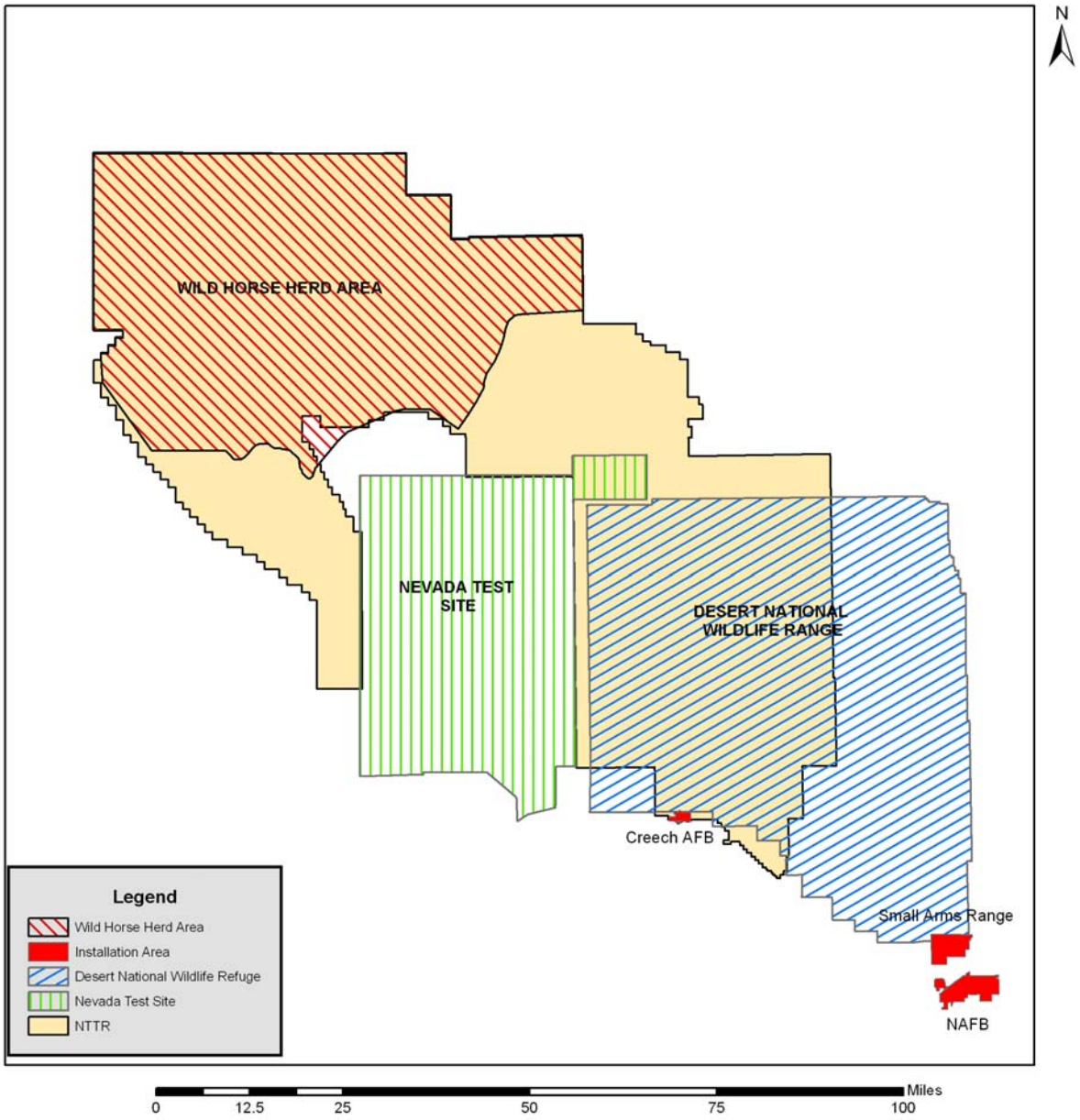
Figure 1.1. NAFB map showing the location of the Small Arms Range and the three management areas.



Section 3014 of Public Law 106-65 identifies management of the lands renewed for military mission. Section 3014 notes that "the Secretary of the Interior shall manage the lands withdrawn pursuant to the Federal Land Policy and Management Act of 1976, other applicable law, and this subtitle." PL 106-65 also states that management plans will be developed by the Secretary of the Interior "after consultation with the Secretary of the military department concerned." The Record of Decision (ROD) for the BLM resource management plan for NTTR was approved on July 1, 2004.

NTTR, often collectively referred to as the "Range," is divided into two parts. The South Range occupies approximately one-third of the total NTTR lands, and the North Range accounts for the remaining two-thirds. NTTR accounts for approximately 12.4% of the 25,000,000 acres of domestic DoD lands, and almost one third of the 9,000,000 acres of Air Force lands in the U.S. It lies in portions of Clark, Lincoln, and Nye counties, Nevada, northwest of Las Vegas. Between the South Range and the North Range lies the Nevada Test Site, administered by the Department of Energy (DoE) (Figure 1-2). The common South Range/DNWR lands are co-managed by the Air Force and USFWS under a Memorandum of Understanding (November 1997). The North Range includes the 1,330,540-acre Nevada Wild Horse Range (NWHR). Management of wild horses on the NWHR is the responsibility of the BLM's Las Vegas District.

Figure 1.2. Locations of areas within NTTR co-managed with the BLM and USFWS.



2.0 DESCRIPTIONS OF PROPOSED ACTION AND ALTERNATIVE ACTIONS

2.1 Proposed Action

The Proposed Action provides guidance for the conservation of natural resources on NTTR and NAFB properties. These guidelines have been developed within the context of the military mission of NTTR and NAFB. The military mission takes precedence over all guidance provided by the INRMP, but is executed within the constraints of existing laws and in a manner that sustains the ranges for future missions. A primary goal of this INRMP is to sustain military readiness while maintaining ecosystem integrity and dynamics on NAFB and NTTR. Maintaining ecosystem integrity promotes good stewardship by supporting existing biodiversity, ensuring sustainable use of the installation, and minimizing management costs and efforts. The Proposed Action provides guidance to the natural resource manager and the mission planners to enable them to establish mission actions that minimize impacts to natural resources at NAFB and NTTR.

Specific activities associated with the proposed action include the following:

1. Wildlife Surveys
    a. Desert Tortoise Surveys: Surveys will be periodically conducted according to USFWS protocol in the South Range, EC South, SAR, and NAFB. Helicopters and ground transportation may be used to access survey sites and to conduct habitat mapping surveys. Transect surveys typically are pedestrian and impacts are minimal. Radio transmitters may be placed on some tortoises according to USFWS protocol to monitor their movement following removal from areas being disturbed by mission activities as required by the current Biological Opinion for Desert Tortoise on NTTR. This replaced a previous statement requiring construction of a tortoise-proof fence.
    b. Candidate Species Surveys: These are mostly conducted by helicopter throughout NTTR, SAR, and NAFB to determine the location of strutting grounds, burrows, and potential habitat areas. Some ground work will be conducted for closer inspection of potential habitat. Some trapping of live animals may be conducted, but only under proper permitting requirements and using approved state or federal protocols.
    c. Migratory Bird Surveys: These surveys are usually conducted on long transects along established roads using ground transportation. Some surveys will involve placing biologists in strategic locations for bird observation during daylight hours. Helicopters or ground transportation may be used to access observation areas.
    d. Small Mammal Trapping Surveys: Areas will be surveyed for small mammals using live traps. Mammals will be identified, measured, possibly tagged, and then released. Some mortality may occur due to high temperatures and predation of traps. Trapping sites will be accessed using ground transportation, helicopters, and walking.
    e. Large Mammal Surveys: These surveys are typically conducted using helicopters. Helicopters may occasionally be landed in areas where more extensive field observation is required.
    f. Bat Surveys: Bats surveys usually involve trapping and netting of live bats. Trapped bats are usually identified, measured, possibly tagged, and then re-

leased. Some mortality of bats may occur due to injury during trapping or netting and predation.

2. Vegetation Surveys: These surveys will be conducted using a combination of helicopters and ground transportation. Samples of vegetation may be taken for species confirmation.
3. Aerial Photography
    a. Mostly involves use of fixed wing aircraft at relatively high altitudes across NTTR.
    b. Areas surveyed will require ground truthing. Ground transportation will be required to locate and place field markers for rectification of photos. Markers will be removed after flights have been completed.
4. Unique Habitat
    a. Seeps and Springs: Located throughout NTTR. Surveys are typically conducted on foot. Transportation to the site may utilize vehicles or helicopters. Seeps and springs will be delineated using Standard USACE wetland delineation methodology and GPS equipment. Soil samples may be taken. Periodically, water and sediment samples may be obtained.
    b. Riparian Corridors: Located throughout NTTR and NAFB. Surveys are typically conducted on foot. Transportation to the site may utilize vehicles or helicopters. Streambeds and channels will be mapped using GPS. Vegetation samples may be taken to confirm species identification.
    c. Rare Plant Surveys: These surveys are typically conducted using ground transportation and helicopters. Extensive pedestrian surveys are often used to find and locate populations. Small samples of soil for laboratory analyses may be taken occasionally.
5. Water Development Inspection and Repair:
    a. Water developments on the South and North Range will be inspected on an annual basis as a cooperative effort with USFWS and NDOW. Inspections are typically conducted using helicopters, but occasionally, ground transportation will be required to access developments requiring major repairs.
    b. Repairs do not involve any activities that would have significant impacts on the environment.
    c. New developments may be constructed. These developments involve minor clearing of small areas and minimal disturbance to the natural environment.
6. Wildlife Exclosure Construction and Maintenance
    a. Fences protecting seeps and springs will be periodically inspected and repaired to prevent damage to these sensitive areas by wild horses.
    b. Ground transportation or helicopters will be used to access most of these sites.
    c. Cage exclosures may be established inside and outside of fenced areas to monitor utilization levels of wild horses and large game. Exclosures are typically cylindrical, 5 ft. high, 4 ft. in diameter and stabilized with iron stakes at the base.
7. Helicopter Transportation
    a. Helicopters used for the activities listed above will be contracted from regional sources as required.
    b. The majority of the time, helicopters will be in flight and not landing.
    c. If landing is required, the landing site will be visually observed for any unique or sensitive habitat and cultural resources. If any are observed, the landing site will be moved to avoid impacts.
    d. Areas selected for landing will be open areas devoid of woody vegetation.

8. Ground Transportation
    a. Ground transportation will only use roads that have previously been prepared for vehicular use.
    b. Vehicles will not be used off-road. This includes use of ATVs.
    c. Vehicles will be driven in a manner to minimize dust production and rutting.
9. Pedestrian Surveys: These surveys will be conducted in a manner to avoid or minimize impacts to vegetation, soils, and other natural features. Any potential cultural resources that may be observed during pedestrian surveys will be located with a GPS, photographed, and reported to the Cultural Resources Manager.

2.2 Alternative Action A

Alternative A would be to operate NTTR and NAFB with no INRMP guidance, but adopting the BLM Range Management Plan (BLM RMP), the NTTR RMP and the U.S. Fish and Wildlife Service's Desert National Wildlife Range Comprehensive Conservation Plan (CCP) when it is approved. For the purposes of this document, the MOU with the USFWS would be used as the guidance document since the CCP is not currently approved. NTTR and NAFB would also be subject to other federal rules and guidelines such as the Endangered Species Act (ESA), Section 404 of the Clean Water Act, the National Environmental Policy Act (NEPA), and others. Compared to the Proposed Action, Alternative A would not:

- Develop a natural resources database.
- Provide additional guidance for rare plant conservation.
- Include additional surveys to update natural resources data for NTTR and NAFB.

2.3 No-Action Alternative

The No Action Alternative is to continue operating under the current INRMP with no improvements as suggested by the revised INRMP. Compared to the Proposed Action, the No Action Alternative would not:

- Develop a natural resources database.
- Provide additional guidance for rare plant conservation.
- Provide details on specific natural resource management guidelines.
- Include a higher level of surveying of natural resources for NTTR and NAFB.
- Propose funding for future projects.

2.4 Federal, State, and Local Permits, Licenses, and Fees/NAFB Environmental Plans

The proposed action will be administered by 99th CES/CEVN. All activities on NAFB and SAR will be coordinated with the 99th ABW and activities on NTTR will be coordinated with 98th RANW. Permits related to environmental concerns that would be required include, but may not be limited to a permit from USFWS or NDOW for trapping animals and Section 7 Consultation with the USFWS. Among the NAFB environmental plans that may be applicable to the proposed actions are *NAFB Hazardous Material Management Plan* (December 2000), NAFB Plan 19-1, *Facility Response Plan*, Volumes I & II (May 2002), *NAFB Cultural Resources Management Plan* (in revision), *NAFB Pest Management Plan* (2005), *NAFB Bird Aircraft Strike Hazard Plan* (in revision), *Range Management Plan* (in revision), and *NAFB Water Management Plan* (May 2004).

2.4 Regulatory Requirements

This EA is prepared in compliance with the *National Environmental Policy Act* (NEPA) (Public Law [PL] 91-190, 1969, as amended), the Council on Environmental Quality (CEQ) *Regulations for Implementing the Procedural Provisions of NEPA* (40 Code of Federal Regulations [CFR] 1500-1508, 1993), and Air Force Instruction (AFI) 32-7061, the *Environmental Impact Analysis Process* which is implemented by 32 C.F.R. Part 989. NEPA (PL 91-190, 1969) requires federal agencies to consider environmental consequences of all proposed actions in their decision-making process. The intent of the NEPA is to protect, restore, or enhance the environment through a well-informed decision-making process. The CEQ was established under NEPA to implement and oversee federal policy in this process. To this end, the CEQ issued the *Regulations for Implementing the Procedural Provisions of NEPA* (40 CFR 1500-1508, 1993). Other federal statutes that may apply to the Proposed Action are listed in Table 1-1.

Table 2-1. Other Major Federal Environmental Statutes, Regulations, and Executive Orders Applicable to Federal Projects

Environmental Resource	***Statutes***
Air	*Clean Air Act* (CAA) *of 1970* (PL 95-95), as amended in 1977 and 1990 (PL 91-604); U.S. Environmental Protection Agency (EPA), Subchapter C-Air Programs (40 CFR 52-99)
Noise	*Noise Control Act of 1972* (PL 92-574) and Amendments of 1978 (PL 95-609); EPA, Subchapter G-Noise Abatement Programs (40 CFT 201-211)
Water	*Federal Water Pollution Control Act* (FWPCA) *of 1972* (PL 92-500) and Amendments; *Clean Water Act* (CWA) *of 1977* (PL 95-217); EPA, Subchapter D-Water Programs (40 CFR 100-149); *Water Quality Act of 1987* (PL 100-4); EPA, Subchapter N-Effluent Guidelines and Standards (40 CFR 401-471); *Safe Drinking Water Act* (SDWA) *of 1972* (PL 95-523) and Amendments of 1986 (PL 99-339); EPA, National Drinking Water Regulations and Underground Injection Control Program (40 CFR 141-149)
Land	*Federal Land Policy and Management Act* (FLPMA) *of 1976* (PL 94-579); *Military Lands Withdrawal Act* (PL 99-606); Land Withdrawal Regulations (43 CFR 2300); *Southern Nevada Public Land Management Act of 1988* (PL 105-263)
Biological Resources	*Migratory Bird Treaty Act of 1918; Fish and Wildlife Coordination Act of 1958* (PL 85-654); Sikes Act of 1960 (PL 86-97) and Amendments of 1986 (PL 99-561) and 1997 (PL 105-85 Title XXIX); *Endangered Species Act of 1973* (PL 93-205) and Amendments of 1988 (PL 100-478); *Fish and Wildlife Conservation Act of 1980* (PL 96-366); *Lacey Act Amendments of 1981* (PL 97-79)
Wetlands and Floodplains	Section 401 and 404 of the *Federal Water Pollution Control Act of 1972* (PL 92-500); EPA, subchapter D-Water Programs 40 CFR 100-149 (105 ref); Floodplain Management –1977 (Executive Order [EO] 11988); Protection of Wetlands-1977 (EO 11990); *Emergency Wetlands Resources Act of 1986* (PL 99-645); *North American Wetlands Conservation Act of 1989* (PL 101-233)

Environmental Resource	***Statutes***
Cultural Resources	National Historic Preservation Act (NHPA) of *1966 (16 United States Code [USC] 470* et seq.) (PL 89-665) and Amendments of 1980 (PL 96-515) and 1992 (PL 102-575); Protection and Enhancement of the Cultural Environment-1971 (EO 11593); Indian Sacred Sites-1966 (EO 13007); *American Indian Religious Freedom Act* (AIRFA) *of 1978* (PL 95-341); *Antiquities Act of 1906; Archaeological Resources Protection Act* (ARPA) *of 1979* (PL 96-95); *Native American Graves Protection and Repatriation Act* (NAGPRA) *of 1990* (PL 101-601)
Range Planning and Operations	*AFI 13-212 and ACC AFI 13-212 Supplement 1*
Environmental Justice	Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations (EO 12898); Protection of Children from Environmental Health Risks and Safety risks (EO 13045)

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3.0 AFFECTED ENVIRONMENT

Based upon the nature of the activities that would occur under the proposed action and alternatives, NAFB environmental program managers determined that the following resources could potentially be affected by this project: land use; noise; air quality; water resources; biological resources; cultural resources; geology and soils; and socioeconomics. The potentially affected environment is described below.

3.1 Land Use

From 1929 to 1941, NAFB property was used for private flight operations. At that time, the Base included dirt runways, a few buildings, and some utility service. The City of Las Vegas purchased the property in 1941 and offered it to the Army Air Corps. The Army Air Corps Gunnery School used the site for gunnery training from 1941 to the end of World War II. The Air Force took command of NAFB in 1949. In 1950, NAFB was named Nellis Air Force Base (Paher, 1971). The Tactical Air Command assumed command of NAFB in 1958, and the Tactical Fighter Weapons Center was established there in 1966. The 554th Operations Support Wing was activated in 1979. Command responsibility for NAFB was transferred to the Air Combat Command on June 1, 1992. Currently, NAFB is used for aircraft operations and maintenance, weapons storage, rock quarrying, and housing and offices. A large portion of NAFB is relatively undeveloped land. SAR is currently used for small arms training. Most of the site is undeveloped land.

NTTR consists of portions of Clark, Lincoln, and Nye counties in Nevada. NTTR was originally established in 1940. The airfields and additional military lands that developed into the Nellis Range Complex were expanded piecemeal between the 1940s and 1960s. A December 1949 agreement with the USFWS described the military utilization of part of the Desert Game Range (established in 1936), stretching northwest from Las Vegas, over the Las Vegas, Sheep, and Pintwater Mountain Ranges. This area has subsequently been used by the military for air-to-ground and air-to-air bombing practice. Plans were first drawn up in December of 1941 to develop Indian Springs as an AT-6A training center (land having been granted on Sept. 22, 1941), but it was not until February of 1943 that construction began including nearly 50 buildings, "100 tents, and two cantonments [that] housed 1,118 men." Use of the Indian Springs Air Field slowed after June of 1945 as the Fixed Gunnery Department was closed, and finally the field was terminated that December. Under the Department of the Air Force, NAFB, which itself was inactive between 1947 and 1949, re-activated Indian Springs in October of 1950, calling it the Indian Springs Air Force Base, later to be renamed the Indian Springs Air Force Auxiliary Field (ISAFAF) in April 1964 (NAFB, 1993). Recently, the ISAFAF was renamed Creech AFB.

On the North Range, the Tonopah Test Range (TTR) was among the areas designated by President F. D. Roosevelt and the Office of the Chief of the Air Corps in 1940-1941 to be included in the Las Vegas Bombing and Gunnery Range. This effectively "cleared up civilian titles in areas near Tonopah, Nevada" (NAFB, 1993), and in August of 1941, some 2,500 acres were transferred to NAFB jurisdiction. More than 82,500 acres were added in 1963, and currently NTTR comprises about 3 million acres. TTR was developed by the Atomic Energy Commission in 1957, and the four Roller Coaster events "were carried out in 1963 and resulted in plutonium contamination of four areas totaling about 193 acres" (SAIC/DRI, 1989). Several portions of NTTR are utilized for electronic warfare, which began in 1975. The Stealth F-117A

program was developed at the TTR (as acknowledged in 1988), and its 37th Fighter Wing was inactivated in 1992.

Currently, NTTR is used for training, testing, and weapons evaluation operations for the USAF, U.S. Army, U.S. Marine Corps, U.S. National Guard, U.S. Navy, DoE, reserve forces, and other federal agencies. Foreign military allies of the United States also train some of their forces at NTTR.

3.2 Noise

At NAFB, the main source of noise is arriving and departing aircraft. In general, most noise levels are in the moderate range with the exception of relatively high levels recorded at the airstrip. Beyond the boundaries of NAFB, noise levels are considered quiet to moderate. A detailed discussion of aircraft noise and measurements in the vicinity of NAFB is provided in NAFB (1999). Because of the level of development around NAFB, noise is more of a problem for humans living in the vicinity of NAFB versus natural resources in the vicinity. Other sources of noise at NAFB include explosions originating from the detonation of unexploded ordnance and quarrying activities in Area II.

In 1997, a noise study for NAFB was conducted to reflect the aircraft mix and use patterns at that time. The study included 80 airfield operations by based aircraft and 250 airfield operations by transient aircraft to represent an average busy day. The 1981 and 1992 studies modeled 460 and 614 airfield operations, respectively (NAFB, 1999)

Each of these studies expressed noise levels (in DNL) as contours based on an average busy day which represented airfield activity during a 24-hour period when the airfield was in full operation (NAFB, 1999). Results of the study are shown in Figure 3-1. Table 3-1 shows the noise levels in and around NAFB broken out by land use. Table 3-2 shows the noise levels for sensitive receptors in the area.

Table 3-1. Noise impinging on various land use areas in the vicinity of NAFB.

Land Use Category	Baseline Noise Contours						
	65-70	70-75	75-80	80-85	>85	Total Acres	Percent of Total
Commercial	304	645	290	0	0	1239	8
Industrial	108	100	18	0	0	226	2
Open/Public	8471	2572	749	391	20	12,204	84
Recreational	39	15	4	0	0	58	<1
Residential	699	68	21	0	0	788	6
TOTAL	**9621**	**3400**	**1082**	**391**	**20**	**14,514**	**100**

Table 3-2. Number of sensitive receptors impacted by noise originating from NAFB.

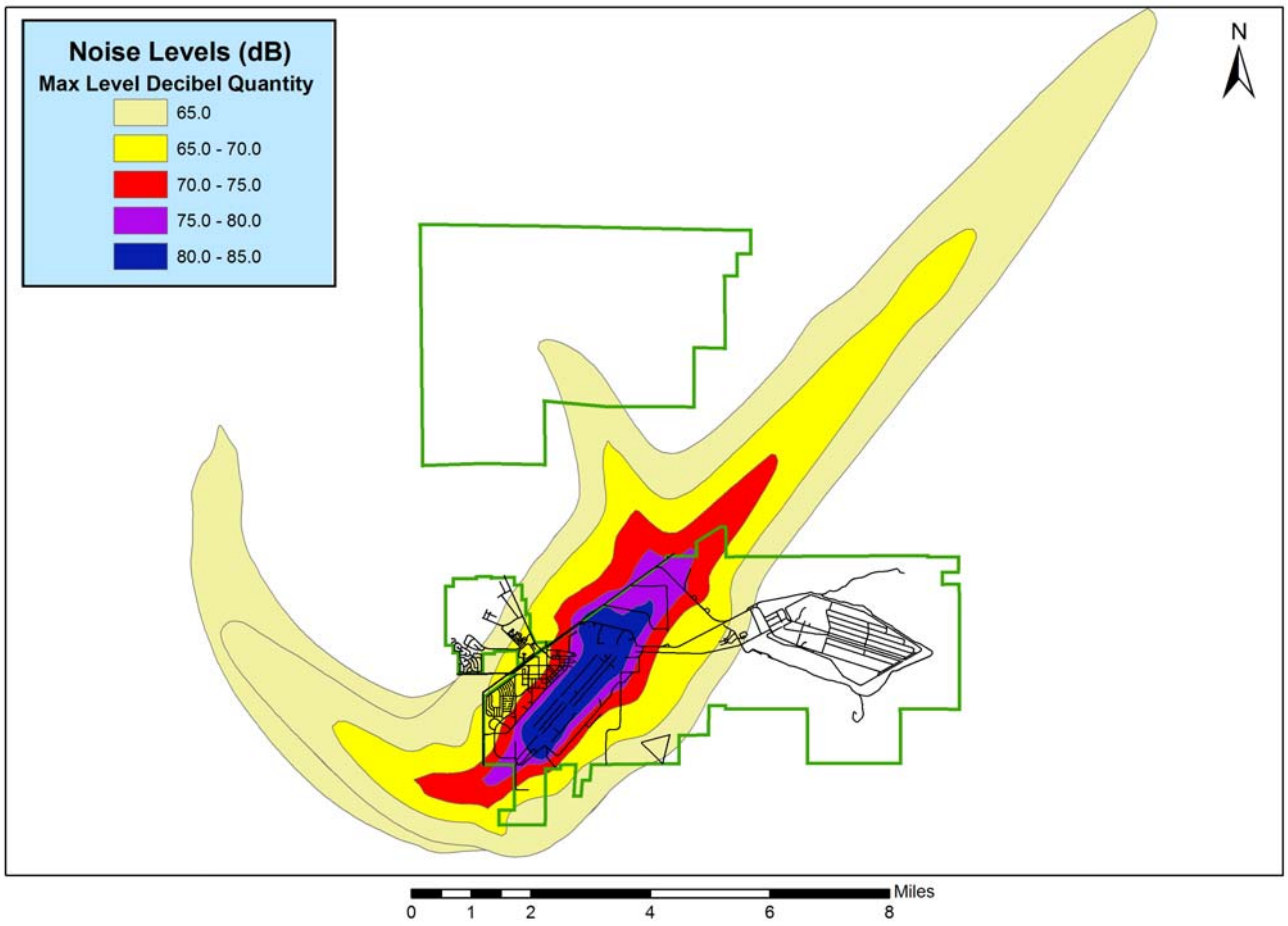
Land Use Category	Baseline Noise Contours (DNL)					
	65-70	70-75	75-80	80-85	>85	Total Acres
Schools	3	0	0	0	0	3
Churches	2	0	0	0	0	2
Parks	1	1	0	0	0	2
TOTAL	**6**	**1**	**0**	**0**	**0**	**7**

At NTTR, high levels of noise are typically intermittent and associated with aircraft operations and target practice. Maneuvers and other aircraft operations sometimes involve low-level flying, which can result in brief periods of high noise levels. In addition, supersonic speeds are allowed in certain areas of the NTTR and may impact wildlife. Similarly, exploding ordnance emit high levels of noise for short periods of time. Most target areas are located in remote playas not known to support populations of sensitive wildlife species. Several studies have been conducted to model and record noise data at NTTR. These studies include Plotkin et. al 1989, Plotkin et. al 1992, Frampton et. al 1993, Page et. al 1994, and Plotkin, 1996. In addition, a general overview of noise in NTTR is provided in the Renewal of the NAFB Range Land Withdrawal Legislative Environmental Impact Statement (NAFB, 1999) and the F-22 Aircraft Development Evaluation and Weapons School Beddown NAFB Environmental Impact Statement (NAFB, 1999a).

NTTR use, in terms of aircraft sorties, is generally expressed as the cumulative total of all sortie-operations conducted in an area. A sortie-operation is the use of one airspace area or subdivision by one aircraft during the course of a sortie mission. On this basis, NTTR use has historically ranged between 200,000 and 300,000 sortie operations annually. In general, NTTR is used for air or ground-based activities nearly 100 percent of the time it is available. Although this means that at any point in time some location on NTTR is probably experiencing noise originating from aircraft, it is important to note that NTTR is 3.0 million acres in size and much of the land expanse would not be impacted by noise. According to U.S. Air Force 1999, the L_{dnmr} for NTTR ranges from 46 to 61 decibels based on 200,000 sortie operations per year.

Other sources of noise include vehicles, high explosive detonations, small arms, and other sources associated with the mission. Probably the most obvious source of noise is exploding ordnance which has been measured as producing greater than 140 decibels within 3,700 ft. of the point of detonation for a 2,000 lb bomb. Areas in proximity to target areas are going to be impacted by this level of noise, but the sound decreases significantly with distance from the detonation point.

Figure 3.1. Maximum level decibel quantity recorded at NAFB in 1997.



3.3 Air Quality

In general, most of NTTR enjoys good air quality due to its remote location and only intermittent occurrence of air pollution releases from sources (Figure 3.2). According to AFI 32-7064, the INRMP does not address air quality and should have minimal positive impacts to air quality. Therefore, this section of the EA is presented to provide baseline information for the reader. The majority of NTTR is listed as "unclassified" with reference to state and federal standards for criteria pollutants including carbon monoxide, nitrates, dust, sulfur dioxide, and volatile organic compounds. This is a result of the fact that very little industry is located in the region and vehicular traffic is minimal. Impacts to air quality on NTTR would be caused by construction activities and ordnance delivery. Fugitive dust content of air can be increased in localized areas for short time periods due to the delivery of live ordnance (NAFB, 1999). Some air pollutants are released during the explosion of ordnance, but these are in small quantities and quickly dissipate following their release. Additionally, fugitive dust levels may increase in construction zones. This can last for longer periods of time if excavated areas are not revegetated or covered with a natural or synthetic material. Movement of vehicles along gravel and unpaved roads also results in the release of fugitive dust in localized areas. This has been decreased by controlling the speed of vehicles on roads at NTTR.

Other sources of emissions on NTTR include combustive emissions associated with construction equipment, vehicles, and aircraft during the day-to-day operations of NTTR. Emissions associated with these activities would be minimal due to the fact that the sources are mobile, intermittent, and occur in localized areas spread over a large geographic region. None of the sources of pollutants found on NTTR would be expected to cause any pollutants to exceed state and federal air quality standards.

The southeastern edge of NTTR and all of NAFB are designated as "serious" non-attainment area for carbon monoxide and particulate matter less than 10 microns in diameter (PM_{10}). NAFB is located in the Las Vegas Valley where visibility is frequently hampered by air pollutants, especially dust and vehicle emissions. These materials and gases are often trapped in the valley area and become concentrated to the point where visibility is significantly decreased or the color of the air is significantly changed. Figure 3.2 shows the carbon monoxide and particulate matter non-attainment areas at NTTR and NAFB. Permitting and other actions in this area are under the jurisdiction of the Clark County Department of Air Quality and Environmental Management, as designated by the governor of the state of Nevada. Exceedances in particulate matter are due to the release of dust from construction, unpaved roads, and unprotected soil surfaces on vacant lands in the metropolitan area of Las Vegas. However, mobile sources are the primary source of particulate matter pollution in Clark County. Approximately 96% of the carbon monoxide in the air in the Las Vegas area is also contributed by cars and trucks. In more than five years, no exceedances for carbon monoxide (CO) have been recorded in Clark County. Because of this fact, Clark County will be requesting of the US Environmental Protection Agency (USEPA) a maintenance plan and re-designation of non-attainment for CO in Clark County. Recently, EPA has designated the Hydrographic Basin 212 boundary as defined by Clark County and the USEPA as non-attainment for ozone (O_3).

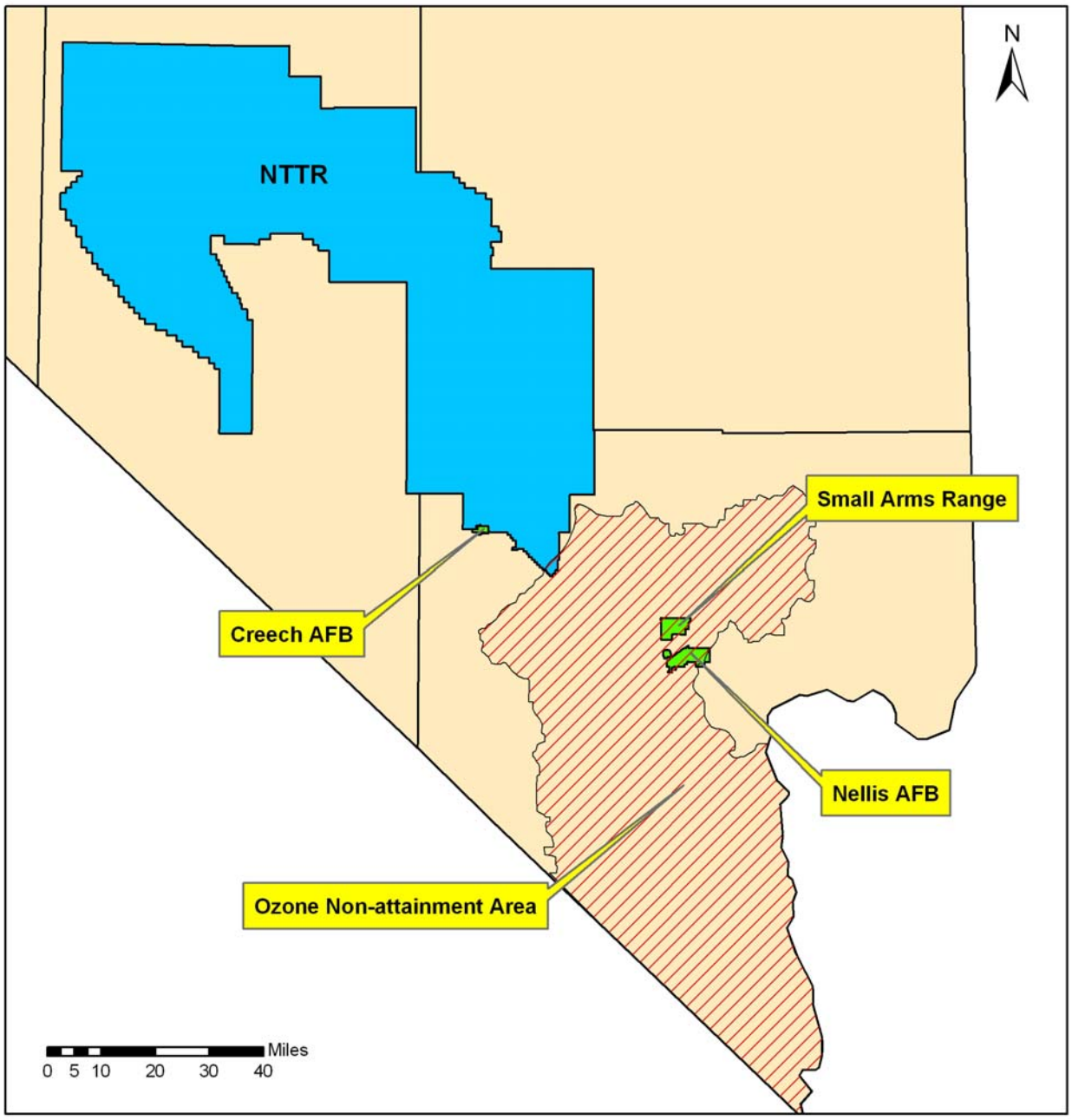
Additionally, the USEPA has designated a larger area for the boundary for the Las Vegas 8-hour ozone nonattainment area (Figure 3.3). However, the boundary is nearly the same as CO/PM_{10} non-attainment area with respect to the South Range and all of NAFB. The remainder of Clark County is designated unclassified/attainment for ozone and includes the adjacent counties. While the nonattainment area is smaller than Clark County, it is still one of the largest nonattainment areas in the country.

Visibility is another issue associated with air quality. Again, NTTR has good visibility except during occasional high winds that may increase the concentration of dust in the air and cause a reduction in visibility. Aircraft can temporarty due to contrails (jet trail caused by compaction of moisture in the air), but this is for on-0.a very short time period and would not be considered significant.

Figure 3.2. Carbon monoxide and particulate matter non-attainment area at NTTR and NAFB.

Figure 3.3. Ozone 8-hour non-attainment area at NTTR and NAFB.

Source: http://www.epa.gov/region9/air/nvozone/clark.html



3.4 Water Resources

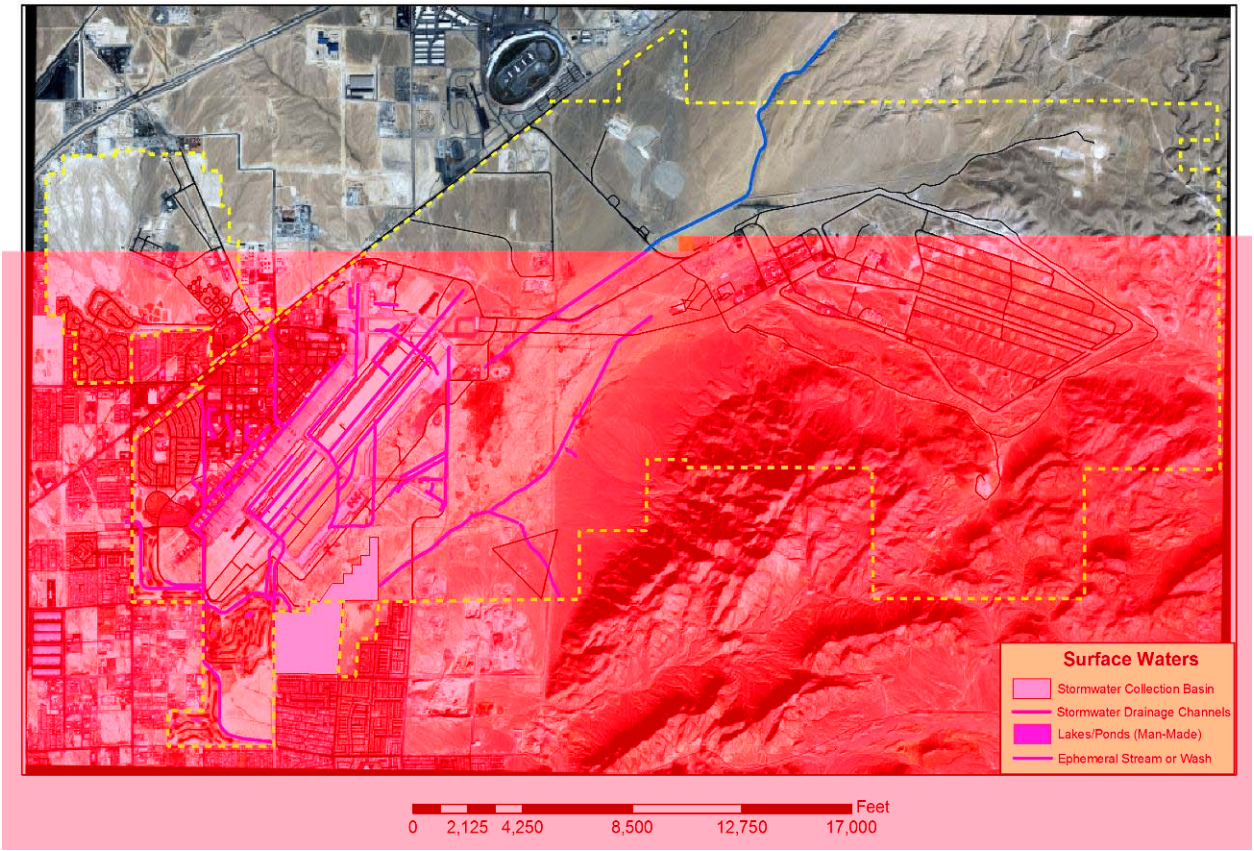
Surface Waters

NAFB is located in the northern portion of the Las Vegas Valley, which extends in a northwest to southeast direction and drains through the Las Vegas Wash into Lake Mead. No natural perennial or intermittent streams, lakes, or springs are found on NAFB due to the low precipita-

tion, high evaporation rates and low humidity (USACE, 2001). All impoundments are man-made and located on the golf course. Water erosion is rare in the basin, but can be somewhat prominent along alluvial fans. This is especially evident in Area II along the base of Sunrise Mountain. The site contains several ephemeral streams or washes that eventually flow into Las Vegas Wash. Figure 3.4 shows the major washes and other surface waters found at NAFB.

Figure 3.4. Surface waters found on NAFB.

Source: NAFB Civil Engineering



Area I of NAFB is an urban environment that contains aircraft facilities, including runways, residences, offices, and recreational facilities. Ponds have been established on the NAFB golf course, but are probably not jurisdictional waters because they are isolated and supplied by artificial sources of hydrology. Storm water in all areas of NAFB generally flows to Clark County Regional Flood Control District channels to the southeast where it is routed into the Las Vegas Wash. Municipal sewage from NAFB is treated by the Clark County Sanitation District in a modern facility and then released into Las Vegas Wash southeast of the Valley. Las Vegas Wash is historically connected directly to the Colorado River. As of March 2003, it follows its historic channel for most of its course, but near the Lake Mead National Recreation Area it is channeled below Lake Las Vegas, the center of a private home and golf course development. After emerging from beneath the Lake, Las Vegas Wash flows approximately one kilometer before emptying into Lake Mead. Because Las Vegas Wash is connected to the Colorado River, any ephemeral streams and washes eventually emptying into the Las Vegas Wash could potentially be considered jurisdictional under Section 404 of the Clean Water Act. This means

that any action that results in the placement of fill in those streams would require coordination with the USACE.

Area II of NAFB is largely undeveloped, but houses the RED HORSE Squadron, EOD, and a munitions storage area. These facilities are also connected to the municipal sewage system. Runoff from the undeveloped desert areas north and east of NAFB during infrequent storm events drains into the Las Vegas Wash to the southeast, which eventually drains into Lake Mead (Colorado River). Area III of NAFB, supporting residential areas, the Hospital, and gasoline storage tanks, is also connected to the municipal sewage system. The Small Arms Range also contains many ephemeral streams, alluvial fans, and draws, all of which are potentially jurisdictional waters of the U.S. because of their eventual connection with the Colorado River.

Similar to NAFB, NTTR is located in a semi-arid to arid region with very few surface water resources and groundwater many hundreds of feet below the surface. Currently, 97 springs and other surface waters have been identified at NTTR (Figure 3.5). These waters are essential for the maintenance of terrestrial wildlife populations. In addition, many of the seeps and springs have developed micro-ecosystems that support a wide variety of plants and animals uniquely adapted to isolated surface waters in desert regions.

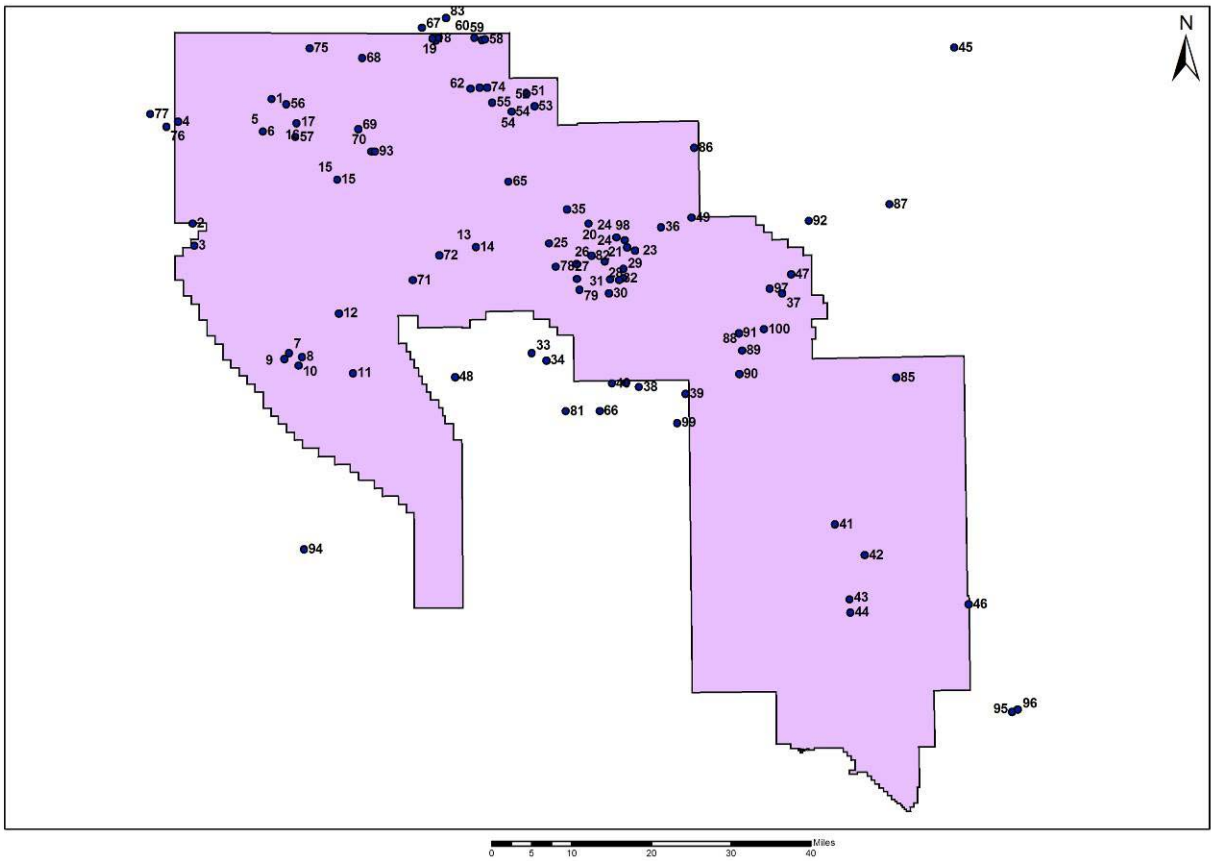
Average annual precipitation at NTTR has been previously discussed and ranges from four inches on the desert floor to about sixteen inches in mountain areas. Although some thunderstorms are sufficiently intense to produce flash flooding, most summer precipitation is lost to evaporation a short time following storm events. However, winter precipitation often forms snow packs in the high mountains. These snow packs store sufficient moisture to allow runoff to overcome high rates of evaporation and transpiration in the warm summer months. Melting snow often provides some water for drainages and riparian corridors in the early spring.

The northern two-thirds of NTTR are located within the Great Basin region of the U.S., which is characterized by internally drained basins. The southern portion of Range 63 drains into the Las Vegas Valley and eventually into Las Vegas Wash. In addition, Range EC South and parts of the Nevada Test Site drain into the Amargosa River. Most of the surface water drains internally into many playas found throughout the area. In the playas, water collects and then eventually evaporates, leaving behind high concentrations of salts and other materials that often cause playas to be void of vegetation. Under current regulations of the USACE, playas and their associated drainages are no longer jurisdictional waters because they are isolated and not connected to waters of the U.S. Thus, consultation with the USACE under Section 404 is not required if the actions place fill material in isolated waters of the U.S. such as playas.

Most of the surface waters at NTTR are ephemeral and exist only in dry washes and on playa surfaces for a few hours following summer storms and possibly a few weeks following winter storms. Very few surface waters and streams would be considered intermittent or perennial due to the fact that their source of water is surface water runoff and not groundwater. With the exception of Breen Creek, NTTR has no permanent streams.

With the exception of some manmade ponds, dugouts, and guzzlers, the only perennial surface waters originate from springs, which either form pools or flow for short stretches across the ground surface. Dugouts are usually located in areas that were excavated in the past to accumulate surface water for livestock.

Figure 3.5. Springs and other surface waters found on NTTR.



SURFACE WATER	NUMBER	SURFACE WATER	NUMBER	SURFACE WATER	NUMBER
Unnamed Seep	1	Johnnie's Spring	32	White Rock Spring	66
Stonewall Spring	2	Black Rock Spring	33	Stinking Springs	67
Jerome Spring	3	Kihibab Spring	34	Fork Spring	68
Wildhorse Spring	4	Antelope Reservoir	35	N. Antelope Reservoir	69
Alkali Spring	5	Chalk Spring	36	Antelope Reservoir	70
Alkali Spring	6	Rock Spring	37	Nixon #1	71
Monte Cristo Spring	7	Tub Spring	38	Nixon #2	72
Rock Spring	8	Cane Spring	39	Tunnel Spring	73
Trappman Spring	9	Wire Grass Spring	40	Corral Spring	74
Tule George Spring	10	Quartz Spring	41	Reservoir #2	75
Pillar Spring	11	Indian Spring/Canyon	42	Cane Spring	76
Larry's Seep	12	Tim Spring	43	Tognoni Spring	77
Jackpot Reservoir	13	Sand Spring	44	Sundown Reservoir	78
Unknown	14	Shale Cut Spring	45	Shirley Spring	79
Antelope Spring	15	White Rock Spring	46	Indian Spring	80
Cactus Spring	16	Quail Spring	47	Live Oak Spring	81
Cactus Spring	17	Summit Spring Drainage	48	Pony Spring	82
Silverbow Spring	18	Beck Spring	49	Silverbow Canyon	83
Silverbow Creek	19	Summer Spring	50	Cresent Valley Res #2	85
Coyote Pond	20	Summer Spring	51	Pink Hills Reservoir	86
Horse Spring	21	Cedar Spring	52	Tule Spring	87
Unnamed Spring	22	Cedar Spring	53	Miners Spring	88
Unnamed Spring	23	Rose Spring	54	Disappointment Spring	89
Cliff Spring	24	Log Spring	55	Belted Reservoir #2	90
Kawich Tank	25	Stealth Seep	56	Naquinta Reservoir #1	91
Lamb's Pond	26	Urania Mine Seep	57	Indian Spring	92
Unnamed Drainage	27	Phantom Spring	58	Cattle Spring	97
Wildcat Spring	28	Sandeen Spring	59	Cliff Spring	98
Gold Spring	29	Thunderbird Spring	60	Reservoir #4	99
Indian Spring	30	Coral Spring	62	Cane Spring	100
Indian Spring	31	Granite Spring	65	Oak Springs	101
Johnnie's Water	32				

Tan Shading: Springs or seeps

Green shading: Dugouts or manmade reservoirs

Wetlands

The only potential wetlands on NAFB are the golf course ponds (NAFB 2002a). The NAFB natural resource specialist requested guidance regarding the wetlands status of these man-made water sources from Mr. Kevin Roukey of the U.S. Army Corps of Engineers, Sacramento District, Nevada State Office. Mr. Roukey indicated that the golf course ponds are not subject to wetlands protection under the provisions of the Clean Water Act because they are man-made and the water source is treated groundwater. The remainder of NAFB is arid scrub land or urban with no wetlands.

A surface water survey was conducted in 1996 to characterize, describe, catalog, and delimit the extent of water resources within the NTTR (Dames and Moore, 1997). The survey focused on seeps, springs, ponds, and one creek. Current conditions of these water resources were characterized in terms of surface water, saturated soils, and value to wildlife, with a goal of identifying potential jurisdictional wetlands rather than conducting formal wetland delineations according to the methodology specified in the 1987 USACE *Wetland Delineation Manual* (Wetlands Training Institute, Inc., 1995).

Sixty-five locations were visited to determine the presence or absence of potential wetlands. The lack of soil inventories available from NRCS, as well as obvious impacts by humans and wild horses, required Natural Resources staff to conduct case-by-case evaluations for each site. In a November 8, 1996 letter to 99th CES, the USACE agreed with the assessments, and a copy of the jurisdictional letter is included with the 1997 report (NAFB, 1997). After the 1996 USACE letter and the 1997 report, the definition of jurisdictional wetlands was narrowed somewhat by the U.S. Supreme Court in *Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers* (SWANCC), 531 U.S. 159 (2001). The INRMP includes consideration of jurisdictional wetlands as defined by the SWANCC case and subsequent court decisions, to the effect that isolated, non-navigable, intrastate waters, with no connection to navigable waters, are not jurisdictional wetlands.

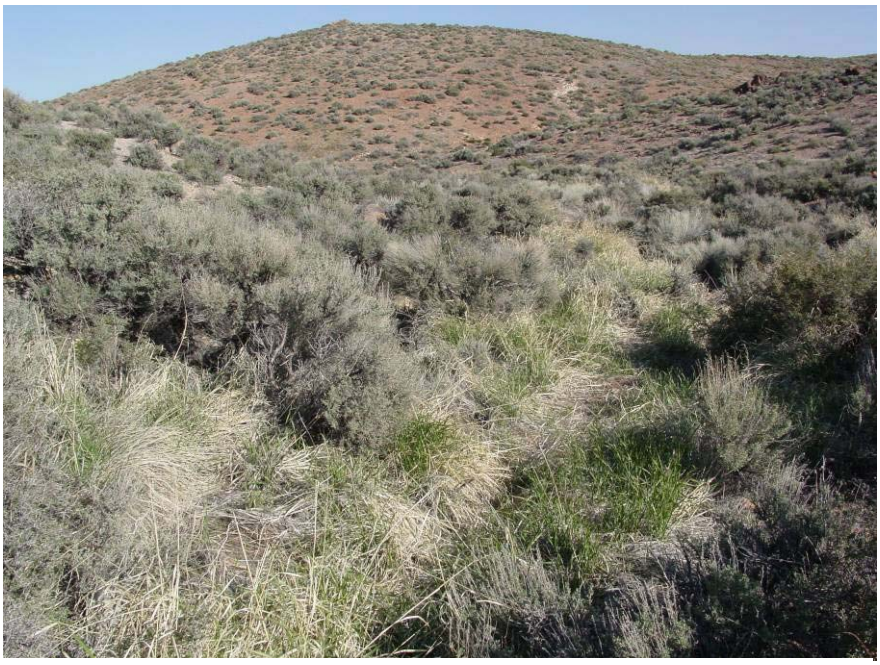


Figure 3-6. Wetlands are often associated with seeps and springs, such as this wetland area located on the North Range.

Although somewhat limited, surface waters on the North Range are more extensive than on the South Range. Four construction water ponds and numerous smaller historic dugouts constructed in the past by ranchers are present on the North Range. Surface waters are extremely limited on the South Range. The largest water body in the area is 300 ft south of Range 65 South, the sewage treatment pond for the town of Indian Springs. Though the pond is technically off NTTR, the sewage

treatment ponds are an important regional resource for wildlife, particularly birds and bats. Because this source is off NTTR and ponds used for sewage treatment are not considered jurisdictional, it will not be addressed further in this report.

The limited surface water resources of the NTTR are unlikely to be designated as waters of the United States by the USACE due to the fact that most of them are part of closed basin watersheds and not connected to navigable waters of the U.S. However, washes and arroyos on the NTTR in areas proposed for disturbance should be surveyed and assessed to determine if they have a discernable ordinary high water mark or meet wetland criteria and if they are connected to navigable waters of the U.S. Consultation with the USACE should be initiated if these criteria are met.

Floodplains

In 1996, a study was conducted for NTTR to delineate hydrographic basins and floodplains (NAFB, 1997). This report actually only identified playas and lakebeds, but is used to provide the summary for the INRMP. These lakebeds have been incorporated into GIS and can easily be transferred to the natural resource database. Floodplains have been mapped by the Clark County Emergency Management Department for NAFB and the Small Arms Range.

Because of arid conditions at NTTR, significant storm events occur only occasionally, and mostly during the winter months. These rain storms can cause flooding, especially when combined with snowmelt in the spring. On the average, localized thunderstorms can produce high intensity, short duration, rainfall events that can result in flash flooding approximately 13 times per year at NTTR. Following a storm event, water tends to collect as surface runoff for a short period of time. Water collected by these storm events is only temporarily present and usually collects in the low-permeability playas. Some channel flow from snowmelt and precipitation events may also occur.

Surface drainage in NTTR generally collects in playas of the major valleys, but does not contribute to groundwater recharge, due to the low surface infiltration potential. Most of the water that collects in the playas is lost through evaporation. Mountain area runoff usually follows steep, scoured, and rocky channels with narrow or non-existent floodplains. Runoff from mountain areas is relatively rapid and usually enters piedmont plains, which serve as a transitional area between the mountains and base-level plains. The slope of piedmont plains is much less than mountain areas, and therefore, runoff is somewhat slower. Runoff on piedmont plains is usually conveyed by piedmonts (erosional surface cut on a rock, usually covered with a thin layer of alluvium), alluvial fans, or old fan remnants across piedmont plains.

Base-level plains, or alluvial valleys, have very shallow land slope and usually end in a low topographic area or playa. Storm water passes through the base-level plains or alluvial valleys in defined channels that have floodplains that are generally wide and flat. These well-defined channels with adjacent floodplains are defined as valley collectors. The topographical low areas or playas ultimately collect in pond storm water runoff. In NTTR, most of the storm water runoff is confined in closed basins and does not flow beyond playas. Floodplains play an important role in natural resource management. Knowledge of the location of floodplains is important in determining sites for targets, roads, and structures. These areas should be avoided to minimize damage caused by floods or high-velocity waters. Floodplains also provide temporary food and habitat for birds and other transient wildlife populations. In addition, many of the floodplain areas provide vernal pools, which are habitat for various invertebrates.

Groundwater

NAFB is located on the eastern side of Las Vegas Valley, an intermountain basin within the Basin and Range Province of the United States. Groundwater flow within Las Vegas Valley is generally from west to east. The valley-fill sediments of the Las Vegas basin are host to a large groundwater reservoir. Groundwater currently accounts for about 29% of the water supply for NAFB. The deeper aquifers at NAFB are not known to have been impacted by contaminants identified in shallow groundwater.

NTTR is located within the carbonate-rock province of the Great Basin (Prudic et al., 1993). This province extends across much of eastern and southern Nevada and western Utah and, because of the permeability of carbonate rocks, supports an extensive, regional groundwater flow system. Groundwater within the carbonate-rock province has been conceptualized as occurring within two interconnected aquifer systems: a regional system that is largely within deeply buried carbonate bedrock, and additional shallow alluvial aquifer systems which are more local in extent and which reside in individual basins or watersheds. Recharge to these aquifer systems comes mainly from the infiltration of winter precipitation that falls on the mountains within the province. Groundwater discharge occurs primarily through evapotranspiration from the valley floors and from spring discharge at large springs.

Much of the measurable groundwater flow within the carbonate rock is relatively shallow and is confined to individual mountain-valley watersheds. The direction of flow in these shallow aquifer systems does not necessarily coincide with flow in the deeper, regional groundwater system, which crosses individual mountain ranges. In general, deep groundwater flow within NTTR is believed to be to the southwest; however, there are only a few wells that could be used to confirm groundwater levels or gradients. Flows in the local aquifer systems are believed to follow surface drainages in most cases. Groundwater is, therefore, expected to move from the surrounding highlands toward the topographic low point within an individual valley or basin.

Several regional groundwater flow systems have been identified in the Great Basin (Harrill et al., 1988). Many of the target complex sites on NTTR are located within the Death Valley regional flow system. The Death Valley flow system is composed of fractured carbonate and volcanic rock and is characterized by interbasinal flow toward the west and southwest, where discharge occurs at several large regional springs. The Death Valley playa in California is considered to be the terminus of this regional flow system.

The Death Valley flow system has been further divided into smaller hydrographic basins, which possess distinct recharge areas (Harrill et al., 1988). These areas contain valley-fill groundwater reservoirs recharged mainly by snowmelt on the adjacent mountains. Precipitation that falls on the valley floors is largely lost to evaporation and evapotranspiration, and provides little recharge to the groundwater systems.

Water quality information is largely limited to regional data on dissolved solids concentrations and the dominant chemical type (Thompson and Chappell, 1984). Generally, the groundwater within the North Range has dissolved solids concentrations that do not exceed 500 mg/L. This groundwater is rich in sodium bicarbonate. Groundwater in the South Range has dissolved solids concentrations, which typically vary from 500 to 1,000 mg/L, and is rich in calcium/magnesium bicarbonate.

The amount of groundwater recharge in mountains in and adjacent to NTTR depends upon precipitation, evapotranspiration, permeability of the surface soils, and vegetation. The greatest opportunity for groundwater recharge is in areas of permeable surface materials during periods when precipitation is in excess of evapotranspiration. However, because evaporation usually exceeds precipitation at rates from -50 to -65 inches annually on NTTR (HAZWRAP PA, 1992), the amount of recharge on valley floors to the groundwater is generally limited.

Well records from the Nevada Division of Water Resources indicate that there are nine permitted water-supply wells on NTTR (Roe, 1998). In addition to these permitted wells, there are wells on NTTR that are used for testing and hydrogeological research projects associated with the Nevada Test Site and other DOE projects. The only known wells within active bombing ranges are on Range 75 in southern Gold Flat, Range 63 and Range 65.

3.5 Vegetation

Large expanses of the valley floors in the Mojave Desert support the creosote bush/white bursage community (Vasek and Barbour, 1997). Creosote bush and white bursage dominate plant communities at elevations from below sea level to about 3,940 ft. This desert scrub community is characteristic of much of the Mojave Desert and can still be observed in less developed areas of NAFB, such as in the eastern portion of Area II and the Small Arms Range. Historic riparian vegetation associated with spring pools, outflow channels, and washes, dominated by cottonwood and mesquite (*Prosopis glandulosa P. pubescens*), is present in the Las Vegas Valley Water District north wellfield (Bradley and Deacon, 1967). Tamarisk, or salt cedar (*Tamarix* spp.), is an introduced (non-native) perennial plant species that has had the most notable effect on these plant associations. The most common tamarisk in the region is *T. ramosissima*, an arborescent shrub that is an aggressive colonizer of areas where groundwater is shallow or where seasonal moisture is available. Tamarisk is known for releasing salt into surrounding soils which, in combination with the plant's aggressive growth and colonization, often results in the establishment of dense, monospecific stands that often preclude the establishment of native species.

The South and North Ranges generally lie in the Mojave and Great Basin biogeographic provinces, respectively, as described by Brown (1982). A biogeographic province is a widespread region that is characterized as distinct from another such region, primarily on the basis of different predominant vegetation and wildlife habitat types. The South Range generally encompasses an area that supports vegetation and habitat types that are characteristic of the Mojave Desert province; whereas the North Range generally encompasses an area that supports vegetation and habitat types characteristic of the Great Basin Desert province.

One indirect, widespread, and persistent effect of EuroAmerican presence in this area, as elsewhere in the West, is the presence of introduced annual and perennial plants, which sometimes dominate local vegetation and are considered invasive species. The three most prominent annual invasives are tumbleweed or Russian thistle (*Salsola tragus*), red brome (*Bromus rubens*), and cheat-grass (*B. tectorum*). Red brome is desert-adapted and has become common on the South Range, while cheat-grass is adapted to cooler steppe environments, and therefore occurs primarily on the North Range. Both grasses are found in remote habitats that otherwise appear pristine and unaffected by EuroAmerican activities. Russian thistle, red brome, and cheat-grass are aggressive colonizers on disturbed soils, and they have replaced native annual populations in some areas. If disturbance is not repeated Russian thistle often does not persist. However, red brome and cheat-grass can continue to be the dominant annu-

als in certain habitats regardless of the disturbance regime. The pest management program for NAFB/NTTR includes control and management of invasive plants.

The South Range lies in the northeastern portion of the Mojave Desert, among the driest of North America's arid lands, where precipitation is often less than 4 in per year (Rundel and Gibson, 1996). Creosote bush/white bursage and saltbush communities are the most common vegetation communities on the South Range. Where soils are especially alkaline and clay-rich, as on the margins of dry lake beds (playas) at the lowest elevations, saltbush species including four-wing saltbush (*Atriplex canescens*), cattle-spinach (*A. polycarpa*), and shadscale (*A. confertifolia*) dominate the vegetation. Saltbush communities, especially near playas, may consist exclusively of these species.

Vast areas of the basins and bajadas in the Mojave Desert, below approximately 3,940 ft, support plant communities dominated by creosote bush and white bursage. Saltbush species, ephedras (*Ephedra* spp.), brittlebush (*Encelia virginensis*), desert mallow (*Sphaeralcea ambigua*), cacti (especially prickly pears and chollas [*Opuntia* spp.]), and Mojave yucca (*Yucca shidigera*) may also occur in this community.

At higher elevations (approximately 3,940 ft to 5,900 ft) blackbrush often is the dominant plant in the community. This plant community includes blackbrush (*Coleogyne ramosissima*), ephedras, turpentine-broom (*Thamnosma montana*), and range ratney (*Krameria parvifolia*). Joshua tree (*Yucca brevifolia*) is another plant that may occur at higher elevations within the creosote bush-white bursage and the blackbrush communities. Current research suggests that the blackbrush community was more widespread in previous centuries but currently is experiencing widespread range reduction. While it is rarely the dominant species in terms of numbers or cover in these communities, the Joshua tree contributes a significant proportionate biomass in the local area, and its mature height of up to 20 ft contributes to its visual domination over the surrounding low shrubs, most of which grow to less than 3 ft tall.

The sagebrush/pinyon-juniper community comprises a woodland that is present on NTTR and is distinctive of the higher elevations of the Mojave and Great Basin Deserts above at least 4,920 ft elevation, and usually above 5,900 ft. At these higher elevations, increased precipitation and lower temperatures facilitate the development of this woodland habitat. The dominant species include big sagebrush (*Artemisia tridentata*), single leaf pinyon and Utah juniper in habitats with deeper soils, and black sagebrush (*A. nova*) in areas with shallow, rocky soils. Joint fir (*Ephedra viridis*) and rabbitbrush species (*Chrysothamnus* spp.) are common subdominants in this woodland. Although they were much more widespread in the lowlands during the last glacial age, post-glacial desertification led to the restriction of this woodland to the highest mountains of the South Range (Spaulding, 1985, 1990).

The blackbrush and sagebrush/pinyon-juniper communities are more limited in distribution, being restricted to higher elevations than the creosote bush/white bursage and saltbush communities. A relict population of single-leaf ash (*Fraxinus anomala*), consisting of only a few individuals, is present on the west side of the Pintwater Range, in Range 64 (NAFB, 1997).

The *hydrographic* Great Basin was described and named by J.C. Fremont in 1844. While crossing over multiple mountain ranges on his east-west travels, Fremont recognized the valley floors he encountered did not have hydrologic outlets, a condition called endorheic (Hubbs et al., 1974). The Great Basin is a collection of endorheic basins that lie between north-south trending mountain ranges. Most of the precipitation that falls, the bulk of it as snow, remains in the region until it is absorbed into the ground or evaporated, but is not drained from the region.

Though the region is warm in the summer and has low relative humidity throughout the year, low temperatures and typically strong winds during the winter make this one of the coldest desert regions in the United States. The entire NTTR lies within the hydrographic Great Basin, with the exception of the southern tip of Range 63.

The Great Basin Desert *floristic region* was defined by Shreve (1942) as that region typified by sagebrush and saltbush vegetation north of about the latitude of Beatty, Nevada. In this region winter temperatures are too low to support plants typical of the warmer deserts of the Southwest, such as creosote bush. Therefore, while both the North and South Ranges lie within the hydrographic Great Basin, only the North Range lies within the floristically-defined Great Basin Desert, while most of the South Range lies within the Mojave Desert.

The vegetation of the basin floors of the North Range is typified by shadscale and greasewood (*Sarcobatus vermiculatus*). Both of these salt-tolerant shrubs may occur in relatively monotypic stands, or may be co-dominant with winter fat (*Krasheninnikovia* [*Ceratoides*] *lanata*) and green molly (*Kochia americana*). Intermediate elevation slopes are dominated by Great Basin mixed desert scrub characterized by various species of horsebrush (*Tetradymia* spp.), rabbitbrush (*Chrysothamnus nauseosus, C. viscidiflorus*), hopsage (*Grayia spinosa*), greasewood, shadscale, and sagebrush (typically budsage, *Artemisia spinescens*). With increasing elevation, the predominance of junipers and pinyons increases with an understory of black sagebrush. Other species that occur in this community include rabbitbrush, joint fir, and occasional Joshua tree. Greasewood may occur as a co-dominant with sagebrush. The blackbrush community reaches its northernmost limit on upper bajadas below the western face of the Groom Range mountains (Beatley, 1976). Elsewhere, blackbrush vegetation occurs in the southerly portions of the North Range at intermediate elevations between the shadscale community and sagebrush-pinyon-juniper community. The dominant vegetation in the North Range mountains above 4,920 ft elevation is sagebrush-pinyon-juniper woodland. White fir (*Abies concolor*) occurs at elevations above approximately 8,200 ft on Bald Mountain in the Groom Range (Beatley, 1976), with single-leaf pinyon and limber pine (*Pinus flexilis*).

One issue on NTTR is the location and extent of a vegetation transition zone between the two deserts, an area that would be expected to include plants from both deserts distributed in a mosaic pattern. Specific indicators of this transition might also be identified. In the existing scientific and technical literature, the author who most directly addressed this issue was Beatley (1976). Beatley identified and described a vegetation transition zone dominated by blackbrush and other plants, such as boxthorn species (*Lycium* spp.), hopsage, and saltbush species, located largely on the Nevada Test Site (see also Beatley, 1976; El-Ghonemy et al., 1980). Extrapolation of Beatley's transition zone boundaries suggests that little of it is represented on either the North or South Ranges, with the notable possible exception of EC South. Alternatively, if the simpler, single boundaries proposed by other authors are more accurate, then more substantial amounts of the boundary or transition may be represented on the Range. Johnston et al. (1992) note that transition zone boundaries can be difficult to determine, especially where community changes are gradual.

This transition zone represents an important region on public lands because it supports species from different biotic regions. A greater diversity of plant and animal species is likely to be found there, which may harbor unique species. Transition zones serve as corridors for some species and as barriers for others, because the transitional habitats can be optimal for some species while being inhospitable for others. On geologic time scales, they are often ephemeral, usually persisting less than 10,000 years (Hansen and diCastri, 1992).

The Nature Conservancy (TNC) conducted a statistical analysis of the vegetative makeup of 185 plots on NTTR, sampled between 1994 and 1997. Of the 185 plots, 78% were classified as either Great Basin or Mojave Desert vegetation types, 15% were classified as transition vegetation, and 7% were unclassified. Sampling of 185 plots was considered a bare minimum, and further sampling was strongly recommended. However, the available data support the hypothesis that the majority of the Range vegetation is closely associated with one desert or another. The Great Basin/Mojave Desert transition, where present, represents a small percentage of NTTR vegetation (NAFB, 1997).

3.6 Wildlife

A large number of vertebrates are represented on NAFB and NTTR. Being a smaller, more urban location, NAFB has a smaller number and variety of species than are present on NTTR. No fish have been found on NTTR and the only fish found on NAFB are the tui chub (*Gila bicolor*), a minnow native to Nevada, coi (*Cyprinus spp.)*, and carp (*Cyprinus carpio*), all of which have been introduced into the golf course pond. In the paragraphs that follow, different types of wildlife inhabiting NAFB, NTTR and SAR will be discussed.

Bats

Bats play an important role in the ecosystem because they feed on many different insects and pollinate various desert flowers. In 1997, a bat survey was conducted for NAFB (NAFB, 1997). In the report, it was stated that 20 species of bats could potentially occur in NTTR. Of those 20 species, six species were actually identified and included the long-legged myotis (*Myotis volans*), fringe-tailed myotis (*M. thysanodes*), California myotis (*M. californicus*), pipistrelle (*Pipistrellus hespereus*), Townsend's big-eared bat (*Plecotus townsendii*), and pallid bat (*Antrozous pallidus*). The California myotis was the most common species observed in the report and was found in almost all habitats that were sampled, including desert scrub, grassland, and woodland. Pallid bats were observed only in desert scrub communities, and fringe-tailed and Townsend's big-eared bats were found in a range of habitats from desert scrub to pinyon-juniper woodland. All of the bats observed on NTTR primarily used caves, abandoned mines, trees, and abandoned buildings for roosts. Preferred foraging and roosting habitat was usually located near open water or desert springs.

Some bats are year-round residents of NTTR and are believed to hibernate between October and April, while others migrate to warmer climates during the winter. Bats found in NTTR are primarily insectivorous and eat a variety of night-flying and ground-dwelling insects, including moths, beetles, flies, and grasshoppers.

Migratory Birds and Raptors

Many species of ducks, geese, and water birds are seasonal migrants in the planning areas and may inhabit playas during wet years. On NTTR, most surface waters are ephemeral and only attract waterfowl during short time periods following storm events. Small populations may inhabit permanent bodies of water located around seeps and springs. In general, the number of waterfowl found in these areas is small and transient. However, mission planners should be cognizant of the fact that temporary bodies of water may attract waterfowl, which could cause damage to low-flying aircraft.

Bird species typically found in sagebrush communities at lower altitudes include the sage thrasher (*Oreoscoptes montanus*), sage sparrow (*Amphispiza belli*), and horned lark (*Eremophila alpestris*). Less frequently observed species include the green-tailed towhee (*Pipilo chlorurus*), mourning dove (*Zenaida macroura*), greater roadrunner, common nighthawk (*Chordeiles minor*), western meadowlark (*Sturnella neglecta*), and common raven (*Corvus corax*). Chukars (*Alectoris chukar)* have been introduced into the area and typically inhabit rocky habitat and desert scrub near freshwater habitat.

The pinyon-juniper woodlands support the greatest bird diversity in the area. Common species include the blue-gray gnat catcher (*Polioptila caerulea*), gray vireo (*Vireo vicinior*), black-throated gray warbler (*Dendroica nigrescens*), juniper titmouse (*Baeolophus ridgwayi*), gray flycatcher (*Empidonax wrightii*), pinyon jays (*Gymnorhinus cyanocephalus*), Townsend's solitaire (*Myadestes townsendi*), and the house finch (*Carpodacus mexicanus*).

Birds present in the Mojave Desert creosote scrub plant communities found on much of the South Range and NAFB include the common raven (*Corvus corax*), horned lark (*Eremophila alpestris*), loggerhead shrike (*Lanius ludovicianus*), mourning dove (*Zenaida macroura*), sage sparrow (*Amphispiza belli*), black-throated sparrow (*Amphispiza bilineata*), burrowing owl (*Athene cunicularia*), greater roadrunner (*Geococcyx californianus*), lesser nighthawk (*Chordeiles acutipennis*), and Gambel's quail (*Callipepla gambelii*). The variety of bird species normally increases where Joshua trees, riparian vegetation, or large cacti are present. The cactus wren (*Campylorhyncus brunneicapillus*) is associated with stands of cholla cactus. Scott's oriole (*Icterus spurius*) are occasionally observed nesting in Joshua trees, and phainopepla (*Phainopepla nitens*), ash-throated flycatcher (*Myiarchus cinerascens*) and blacktailed gnatcatchers *(Polioptila melanura*) are associated with riparian scrub habitat dominated by mesquite (NAFB, 1999).

Horned larks are probably the greatest problem for mission activities, due to the fact that they often congregate near airfields increasing the potential for collision with aircraft. Unfortunately, horned larks often form large flocks that may occupy a single runway. Horned larks are not particularly adapted to desert habitat and require succulent food or surface water for their livelihood. Management of the horned lark can include avoiding accumulations of water in or near runways.

Raptors are protected by the Migratory Bird Treaty Act and/or the Eagle Protection Act. These species are very important because of their functional role as predator of small mammals, reptiles, and other birds. Some raptors also consume carrion. Field observations indicate that as many as 18 different species of raptors may use the NTTR. Observations from the 1996 survey indicate that raptors inhabiting NTTR for nesting purposes include red-tailed hawks (*Buteo jamaicensis*), golden eagle (*Aquila chrysaetos*), prairie falcons (*Falco mexicanus*), American kestrels (*Falco sparverius*), common barn owls (*Tyto alba*), and the great horned owl (*Bubo virginianus*). Swainson's hawks (*Buteo swainsoni*) and ferruginous hawks (*Buteo regalis)* may also be present across NTTR, but would be expected to be more common in the North Range. Because of their size, raptors can pose serious bird aircraft strike hazard (BASH) issues for aircraft.

Reptiles and Amphibians

Reptiles are common across the entire NTTR and NAFB, while amphibians are scarce and only found in areas containing perennial sources of water. The most common amphibians found in NTTR are the Great Basin spade-foot toad (*Scaphiopus intermontanus*) on the North

Range and the western spade-foot toad (*Scaphiopus hammondi*) and the western toad (*Bufo boreas*) on the South Range. Reptiles are less abundant in the North Range, probably due to the colder climate. Common reptiles found in NTTR include the desert tortoise (*Gopherus agassizii*), banded Gila monster (*Heloderma suspectum cinctum*), side-blotched lizard (*Uta stansburiana*), California whiptail (*Cnemidophorous tigris*), zebra-tailed lizard (*Callisaurus draconoides*), desert spiny lizard (*Sceloporus magister*), desert night lizard (*Xanthusia vigilis*), chuckwalla lizard (*Sauromalus obesus*), and the desert horned lizard (*Phyrnosoma platyrhinos*). Common snakes include the coach whip (*Masticophis flagellum*), western patch-nosed snake (*Salvadora hexalepis*), gopher snake (*Pituophis melanoleucus*), western shovel-nosed snake (*Chionactis occipitalis*), and the Mojave rattlesnake (*Carotalus Scultulatus*). On the North Range, additional reptile species have been observed and include the sagebrush lizard (*Sceloporus graciosus*), Long-nosed leopard lizard (*Gambelia wisilenii*), Great Basin rattlesnake (*Crotalus viridis luteosus*), and Hopi rattlesnake (*C.v. nuntius*).

Small Mammals

Common small mammals found in NTTR and NAFB include the following:

- Coyote (*Canis latrans*)
- Badger (*Taxisdea taxus*)
- Black-tailed jackrabbit (*Lepus californicus*)
- Desert kit fox (*Vulpes macrotis*)
- Bobcat (*Lynx rufus*)
- Red fox (*Vulpes fulva*)
- Gray fox (*Urocyon cinereoargenteus*)

In addition to these larger species, smaller mammals and rodents are a very common component across NTTR. Recently, small mammal studies have been conducted in the north range of NTTR and NAFB. Species observed in these studies include whitetail antelope ground squirrel *(Ammospermophilus leucurus),* Merriam kangaroo rat *(Dipodomys merriami)*, desert woodrat *(Neotoma lepida),* northern grasshopper mouse *(Onychomys leucogaster),* deer mouse *(Peromyscus maniculatus),* little pocket mouse *(Perognathus longimembris),* and Great Basin pocket mouse *(Perognathus parvus)* (NAFB, 2006). Small mammals serve important functions in the ecology of the desert, providing food sources for carnivores, and facilitating seed germination, seedling establishment, mixing of soils, and enhancement of nutrient cycling.

Wild Horses

Throughout the past two hundred years, ranchers, miners, and other settlers have released horses (*Equus caballus*) into the western states, including Nevada. These horses multiplied and continue to endure in the north-central portion of NTTR. In 1962, the U.S. Air Force and the Bureau of Land Management worked together and agreed to create the Nevada Wild Horse Range (NWHR) on the north-central portion of the NAFR and the BLM was given the task of managing it. In 1972, Public Law 92-195, the Wild Free-Roaming Horse and Burro Act was created to protect wild horses, and the Cooperative Agreement between the BLM and USAF in 1974 (Appendix B of the ROD for the BLM Range Management Plan) gave the BLM the responsibility of conducting annual censuses of the horses and determining the condition of vegetative resources on the NWHR. In 1977, approximately 800 horses roamed the NWHR; however, since that time, the population has increased substantially, reaching a peak of approximately 10,000 wild horses in 1993 (Science Applications International, 1999).

Because of concerns regarding overpopulation and over-grazing of wild horses, the *Nevada Wild Horse Range Herd Management Plan* established an Appropriate Management Level (AML) of 2,000 wild horses on the NWHR in 1989. This AML was to be determined by the amount of forage and water available to the horses, as monitored annually by the BLM, and consequently would be expected to vary occasionally. The most recent AML was set by the Record of Decision for the NTTR Resource Management Plan EIS (U.S. Dept. of Interior, 2004a) in 2004 and determined to be 300-500 horses. These AMLs, which have yet to be reached, are maintained by the BLM through horse gathers conducted cooperatively with the USAF. In 1998, a total of 820 horses remained on the NWHR (U.S. Dept. of Interior, 2004). The Dec 2003 gather removed 1100 horses leaving approximately 530 horses on the NTTR. In 2005, a total of 880 horses were counted on NTTR.

Large Game

Mule deer, antelope, desert bighorn, and mountain lions are prominent large mammal species found on NTTR. Mule deer, antelope, and desert bighorn serve as good indicators of range conditions on NTTR. If they are maintaining or increasing their population size, expanding their distribution, and are individually maintaining themselves in good health, it is likely that the local ecosystem is in good condition. Black bear and mountain lions are rarely observed on NTTR, but play an important role as predators of other large and small mammals.

In general, mule deer reside in the mountain ranges throughout NTTR year-round. However, census data concerning mule deer is completely lacking at this time. It appears that deer may move between mountain ranges, but no regular migration pattern has been documented (USAF, 1985). Poor water distribution during the summer and lack of cover appears to limit use of NTTR by deer during the winter and spring. Mule deer prefer areas that have hiding cover, and, therefore, are not commonly found in valley locations and in the southern Range area. Preferred habitat by mule deer includes open woodlands with an understory of big sage, black sagebrush, bitter brush, and cliff rose. The deer appear to prefer mountains over valleys.

A conspicuous member of the wild fauna of the North Range is the pronghorn antelope, an animal unique to North America. Pronghorn populations appear to be highest where water sources are less than 1-2 miles apart, but they have been shown to travel over five miles for water. The pronghorn diet is usually palatable forbs in the spring and summer and shrubs in the summer and winter. They eat a variety of forbs, grasses, and shrubs, but favor sagebrush on the North Range. Due to this preference, they can be seen regularly on the east side of Cactus Flat on the North Range during morning hours and before sunset, in areas where sage-brush and other perennial forage items are present. They can travel 3 miles or more from the nearest source of surface water. Breeding occurs between late July and early October.

Very little information has been gathered in recent years concerning pronghorn populations and the location of pronghorn herds at NTTR. Although their population was in decline on the North Range in the early 1990s, pronghorn have apparently increased by 1996 with the reduction in the wild horse population (A. Shepherd, BLM, 1996, personal communication). Recently, one pronghorn antelope was observed in the South Range, which may indicate that their range is expanding (R. Turner. 99th CES/CEVN, 2004, Personal communication). Unlike deer, pronghorn antelope prefer open, short-grass ranges with scattered brush. Hiding cover does not appear to be an important component of pronghorn habitat. On NTTR, pronghorn antelope are year-round residents in all or part of Cactus Flat, Kawich Valley, Sand Springs Valley, and Immigrant Valley.

Populations of desert bighorn sheep are found in and around the mountainous portions of the South Range and around Stonewall Mountain and the east side of Pahute Mesa and Cactus Range on the North Range. They favor higher elevations in the summer and lower elevations in the winter. Mean body weights range from 290-320 lb. In males, more than 10% of the body weight may be in the head because of the large, curved horns (Lawson and Johnson, 1982). Hunting for this species is permitted for 15 days in December through January on the South Range in the Spotted and Pintwater ranges, and for 3 weeks in November on the North Range at Stonewall Mountain. Tags are awarded through a draw conducted by the Nevada Division of Wildlife (NDOW). The sheep tend to travel in herds of 5 to 30 animals, with grazing areas up to 12 miles in diameter, centered around water sources. The mating season, or rut, reaches a peak in August or September. Lambs are usually born singly in the spring (Lawson and Johnson, 1982).

3.7 Federally-Listed Threatened and Endangered Species

The purpose of the *Endangered Species Act of 1973*, as amended, is *to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve the purposes of the treaties and conventions* regarding endangered species that the United States has with other countries. The Act protects all animal, plant, and insect species federally listed as threatened or endangered. The only federally-listed species potentially found on the NTTR is the desert tortoise (*Gopherus agassazii*).

The desert tortoise (*Gopherus agassizii)* is a native animal that has received a great deal of public attention in southern Nevada because of its status as a threatened species under the federal Endangered Species Act and Nevada Administrative Codes. It is found in undeveloped habitats in the area, though in varying densities. It plays an important role in desert ecosystems by excavating burrows in which it escapes the heat of summer, and in which it hibernates during winter to escape low temperatures. This burrowing habit provides shelters that are used by other animals and assists in the cycling of nutrients, seeds, and biomass in the dry Mojave Desert environment.

During a 1991 survey of 5,703 acres, 14 desert tortoises were found in Area II (Sierra Delta Corp., 1991). Any proposed habitat disturbance in that area will require a Section 7 consultation with USFWS. Desert tortoises can be found in very low densities in Area II of NAFB, from the flight line east to Sunset Mountain. Informal surveys of Area II indicate that the tortoise population increases in density as one moves from the valley to the base of Sunset Mountain. A recent survey found that Area III does not support desert tortoise populations and, because it is isolated and enclosed by artificial barriers, additional surveys will no longer be required by the USFWS on that area (NAFB, 2004). Desert tortoises prefer Mojave Desert valley bottoms and bajadas (alluvial slopes), though they may also be found at slightly higher elevations on rocky hillsides (Germano et al., 1994). They have been observed in low densities in the valleys of Ranges 62 and 63 on the South Range. Maps of NAFB and NTTR depicting the known locations of desert tortoise would be useful for current and future planning. The desert tortoise has also been observed in the South Range of NTTR and a map of habitat is currently being developed for that area. Potential habitat has been observed in EC South, but further studies are to be conducted to determine if tortoises are in that range area.

Other Species of Concern

Other than the desert tortoise, one plant species and four animal species (exclusive of bats) considered species of concern by resource agencies have been observed, or occur, on NAFB property. These are the Las Vegas bearpoppy (*Arctomecon californica*), , chuckwalla (*Sauromalus obesus*), western burrowing owl, banded gila monster (Heloderma suspectum cinctum), and phainopepla (*Phainopepla nitens*). The bearpoppy populations are small, but their potential occurrence in the location on undeveloped land should be determined by focused surveys in the spring. The chuckwalla, a large lizard, has been confirmed in Area II by sightings of the species' diagnostic scat. Western burrowing owls have been observed on NAFB, and phainopepla are likely at the Desert Wells Annex because of the suitable habitat found on that property. The phainopepla (Federal: Migratory Bird; State: Protected) is a black bird that is found primarily in mesquite thickets. Several genera of bat species, some of which are sensitive utilize NAFB surface water sources but only the presence of California myotis (*Myotis californica*) has been confirmed on NAFB. At least 18 species of bats are known within the region. The tables that follow list species of concern potentially found at NAFB, NTTR, or SAR.

Table 3-3. State and federal listed reptile and amphibian species of concern potentially found on NTTR and NAFB.

COMMON NAME	SCIENTIFIC NAME	STATUS	
		NATIONAL	STATE
REPTILES			
Common Chuckwalla	*Sauromalus obesus*	SoC	Sensitive
Short-Horned Lizard	*Phrynosoma douglasii*	Unlisted	Sensitive
Banded Gila monster	*Heloderma suspectum cinctum*	SoC	Special
Desert Tortoise	*Gopherus agassizii*	Threatened	Special
AMPHIBIANS			
Relict Leopard Frog	*Rana onca*	Candidate	Special
Northern Leopard Frog	*Rana pipiens*	Unlisted	Sensitive
Columbia Spotted Frog	*Rana luteiventris pop*	Candidate	Special
Amargosa Toad	*Bufo nelsoni*	Unlisted	Sensitive
Arizona (southwestern) Toad	*Bufo microscaphus microscaphus*	Unlisted	Sensitive

Table 3-4. State and federal listed bird species of concern potentially found on NTTR and NAFB.

COMMON NAME	SCIENTIFIC NAME	STATUS	
		NATIONAL	STATE
Western Least Bittern	*Ixobrychus exilis hesperis*	SoC	Sensitive
Yellow-Breasted Chat	*Icteria virens*	Unlisted	Sensitive
Greater Sandhill Crane	*Grus candensis tabida*	Unlisted	Sensitive
Western Yellow-Billed Cuckoo	*Coccyzus americanus occidentalis*	Candidate	Special
Long-Billed Curlew	*Numenius americanus*	Unlisted	Sensitive
Bald Eagle	*Haliaeetus leucocephalus*	Threatened	Endangered
Golden Eagle	*Aquila chrysaetos*	Unlisted	Sensitive
Peregrine Falcon	*Falco peregrinus*	Endangered	Special
Prairie Falcon	*Falco mexicanus*	Unlisted	Sensitive
Black Rosy-Finch	*Leucosticte atrata*	Unlisted	Sensitive
Southwestern Willow Flycatcher	*Empidonax traillii extimus*	Endangered	Special
Northern Goshawk	*Accipiter gentilis*	SoC	Sensitive
Ferruginous Hawk	*Buteo regalis*	SoC	Sensitive
Swainson's Hawk	*Buteo swainsoni*	Unlisted	Sensitive
White-Faced Ibis	*Plegadis chihi*	SoC	Protected
Pinyon Jay	*Gymnorhinus cyanocephalus*	Unlisted	Sensitive
Osprey	*Pandion haliaetus*	Unlisted	Protected
Flammulated Owl	*Otus flammeolus*	Sensitive (USFS)	Sensitive
Long-Eared Owl	*Asio otus*	Unlisted	Protected
Western Burrowing Owl	*Athene cunicularia hypugaea*	SoC	Sensitive
Phainopepla	*Phainopepla nitens*	Unlisted	Sensitive
Mountain Plover	*Charadrius montanus*	Proposed Threat-ened	Sensitive
Western Snowy Plover	*Charadrius alexandrinus nivosus*	Threatened	Sensitive
Yuma Clapper Rail	*Rallus longirostris yumanensis*	Endangered	Unlisted
Red-Naped Sapsucker	*Sphyrapicus nuchalis*	Unlisted	Sensitive
Loggerhead Shrike	*Lanius ludovicianus*	SoC	Sensitive
Vesper Sparrow	*Pooecetes gramineus*	Unlisted	Sensitive
Wood Stork	*Mycteria americana*	Endangered	Special
Black Tern	*Chlidonias niger*	SoC	Sensitive
Least Tern	*Sterna antillarum*	Endangered	Special

COMMON NAME	SCIENTIFIC NAME	STATUS	
		NATIONAL	STATE
Crissal Thrasher	*Toxostoma crissale*	Unlisted	Sensitive
Le Conte's Thrasher	*Toxostoma lecontei*	Unlisted	Sensitive
Juniper Titmouse	*Baelophus griseus*	Unlisted	Sensitive
Gray Vireo	*Vireo vicinior*	Unlisted	Sensitive
Lucy's Warbler	*Vermivora luciae*	Unlisted	Sensitive
Macgillivray's Warbler	*Oporornis tolmiei*	Unlisted	Protected
Orange-Crowned Warbler	*Vermivora celata*	Unlisted	Protected
Yellow Warbler	*Dendroica petechia*	Unlisted	Protected
Lewis' Woodpecker	*Melanerpes lewis*	Unlisted	Sensitive
Common Yellowthroat	*Geothylpis trichas*	Unlisted	Protected

Table 3-5. State and federal listed mammal species of concern potentially found on NTTR and NAFB.

COMMON NAME	SCIENTIFIC NAME	STATUS	
		NATIONAL	STATE
Allen's Big-Eared Bat	*Idionycteris phyllotis*	SoC	Sensitive
Big Free-Tailed Bat	*Nyctinomops macrotis*	SoC	Sensitive
Brazilian Free-Tailed Bat	*Tadarida brasiliensis*	Unlisted	Sensitive
California Leaf-Nosed Bat	*Macrotus californicus*	SoC	Sensitive
Greater Western Mastiff Bat	*Eumops perotis californicus*	SoC	Sensitive
Hoary Bat	*Lasiurus cinereus*	Unlisted	Sensitive
Mexican Long-Tongued Bat	*Choeronycteris mexicana*	SoC	Unlisted
Pale Townsend's Big-Eared Bat	*Corynorhinus townsendii palles-cens*	Sensitive (USFS)	Special
Pallid Bat	*Antrozous pallidus*	Unlisted	Sensitive
Silver-Haired Bat	*Lasionycteris noctivagans*	Unlisted	Sensitive
Spotted Bat	*Euderma maculatum*	SoC	Special
Western Red Bat	*Lasiurus blossevillii*	Unlisted	Sensitive
Hidden Forest Uinta Chipmunk	*Neotamias umbrinus nevadensis*	SoC	Unlisted
Palmer's Chipmunk	*Neotamias palmeri*	SoC	Unlisted
Fish Spring Pocket Gopher	*Thomomys bottae abstrusus*	SoC	Sensitive
San Antonio Pocket Gopher	*Thomomys bottae curtatus*	SoC	Sensitive

Area III in 1994. The three populations located in Area II in 1993 were re-surveyed in 1996. A large population of at least 1,000 individuals is located near the extreme southeastern boundary of Area II. A second Las Vegas bearpoppy population of approximately 200 individuals occurs in an area known as Trollville, northeast of the above area and just south of some desert tortoise enclosure fences (Knight, 1997). A third, small population is located in the north-central portion of Area II, near a series of active sand dunes. The population occurring in Area III is located behind the NAFB hospital and housing. The Area III Las Vegas bearpoppy population is the largest on NAFB. A recent survey of the area indicated that the bearpoppy populations were in excess of 1000 plants. In addition, a population of Las Vegas buckwheat (*Eriogonum corymbosum* var. *nilesii*), proposed as a state Critically Endangered Species was observed and documented.

Las Vegas buckwheat grows in dry, stony grasslands and other sparse habitats supported by gypsiferous soils often forming low mounds or outcrops in washes and drainages, or in areas of generally low relief. The plant is often growing in close association with Las Vegas Bearpoppy and other desert basin plants such as burro-weed and creosote bush. Unlike the Las Vegas Bearpoppy, the Las Vegas buckwheat is a perennial shrub ranging from 1 to 4 ft. in height. The plant has pale yellow flowers and sparse silvery tufts of cobwebby hair on flowering branches and upper leaf surfaces. Though this plant is not officially afforded protection under state and federal regulation, it is on several watch lists for its rarity and declining population.

Rare Plants

TNC conducted surveys of rare plant species on NTTR in 1992 and 1994. In the course of these surveys, they did not identify any species that are currently federally listed as threatened or endangered. However, 55 plant species were identified as occurring or potentially occurring on NTTR based on the NNHP ranking system. Of the 55, 15 were located during the study (NAFB, 1997). These 15 species of concern are listed in Table 4-5. One federal candidate for listing has been found on the Range, *Astragalus oophorus* var. *clokeyanus* (Bair, 1997). Two new plant species of *Phacelia (Hydrophyllacae)--[Phacelia filiae and Phacelia petrosa]*—are species of concern and were recently identified on NTTR by TNC in cooperation with the USFWS Western Ecological Services, and Brigham Young University.

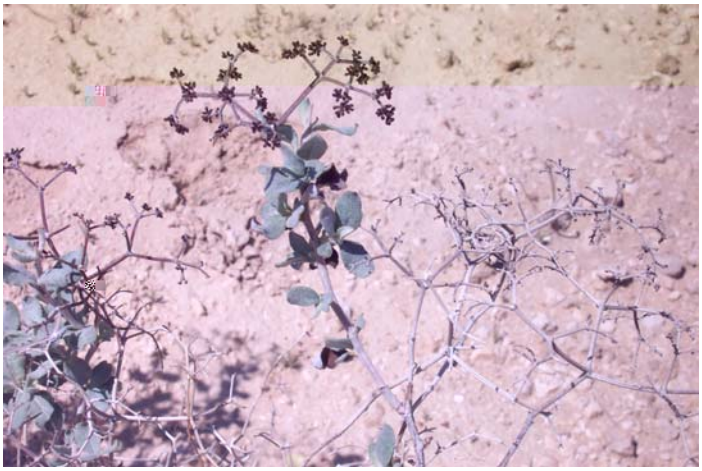


Figure 3.8. Las Vegas Buckwheat

Figure 3.9. Growth form of *Astragalus oophorus* var. *clokeyanus* in Lee Canyon, Spring Mountains. Photograph by Frank Smith courtesy of Nevada Natural Heritage Program Status Report March 2002.

Table 3-6. Plant Species of Concern Located on NTTR.

Species of Concern	Federal Status		State Status	BLM Status	NNHP Ranking
	Pre-1996	Post-1996			
Arctomecon merriamii	C2	SOC	None	Special Status Species	G3S3
Astragalus ackermanii	C2	SOC	None	None	G2S2
Astragalus amphioxys var. musimonum	C2	SOC	None	Special Status Species	G5T2S2
Astragalus beatleyae	C1	SOC	None	Special Status Species	G2S2
Astragalus funereus	C2	SOC	None	Special Status Species	G2S2
Astragalus gilmanii	C2	SOC	None	Special Status Species	G3S1
Astragalus mohavensis var. hemigyrus	C2	SOC	CE	Special Status Species	TST3G3S2S3
Astragalus oophorus var. clokeyanus	C1	None	None	Special Status Species	G4T1S1
Chrysothamnus eremobius	C2	SOC	None	Special	G1S1

Species of Concern	Federal Status		State Status	BLM Status	NNHP Ranking
	Pre-1996	Post-1996			
				Status Species	
Cymopterus ripleyi var. saniculoides	C2	SOC	None	Special Status Species	G2T1S1
Erigeron ovinus	C2	SOC	None	Special Status Species	G2S2
Penstemon pahutensis	C2	SOC	None	Special Status Species	G3S3
Phacelia beatleyae	C2	SOC	None	Special Status Species	G3S3
Phacelia parishii	C2	SOC	None	Special Status Species	G2S1G2G3S2S3
Porophyllum pygmaeum	C2	SOC	None	Special Status Species	G2S2

Sage Grouse

In recent years, the sage grouse, a popular game species, has declined in numbers and distribution in Nevada. Because of the downward trend in numbers, concerned citizens have advocated a Range-wide listing under the ESA. On January 7, 2004, the USFWS completed its status review of the sage grouse throughout its range and determined that the species does not warrant protection under the Endangered Species Act at this time. However, the USFWS also stated, "...the status review clearly illustrates the need for continued efforts to conserve sage-grouse and sagebrush habitat on a long-term basis." It is the intent of the INRMP to support conservation of this species on NTTR.

Nesting habitat for the sage grouse is characterized primarily by big sagebrush communities having 15% to 38% canopy cover with a grass and forb understory. Potential sage grouse habitat has been observed in the North Range in the area of the Kawich Range. Live sage grouse have been observed by NDOW in the area at the boundary between NTTR and BLM public lands on the Kawich Range, and the grouse may be inhabiting the Belted Range.

Pygmy Rabbit

In March 2003, the pygmy rabbit was federally listed as an endangered species in Oregon. These rabbits are found in the Great Basin, which comprises approximately two-thirds of the land area of NTTR. This animal is the only rabbit in the U.S. that digs its own burrows and typically prefers deep loamy soils for burrowing. Additionally, this is the smallest rabbit known in the world and is dependent upon sagebrush for winter food.

Unlike most of the cottontail rabbits, pygmy rabbits have an entirely gray-brown tail lacking a white underside. The species prefers shrub grasslands found on alluvial fans, floodplains, plateaus, high mountain valleys, and mountain slopes where suitable sagebrush cover and soils

for burrowing are available. Although the species may be found on a relatively sparse cover of sagebrush and shallow soils, it prefers patches of dense sagebrush and deeper soils. Big sagebrush is the dominant shrub at all sites where the pygmy rabbit has been observed. In most cases, big sagebrush cover averages 21-23%, with bare ground averaging 33% and herbaceous broadleaf forbs averaging 5-6%. The average height of sagebrush in occupied sites was 16 inches.

Figure 3.10. Pygmy Rabbit
Courtesy NDOW
http://ndow.org/wild/animals/facts/rabbit_pygmy.shtm

Pygmy rabbits dig burrows that extend to a depth of 3 ft and often form chambers as part of the burrow system. Big sagebrush is the primary food source for the pygmy rabbit, but grasses and forbs are also eaten, especially in mid-to-late summer. The pygmy rabbit can be active at any time of day but is usually active early in the morning and late in the afternoon. No special management methods have been developed or implemented specifically for pygmy rabbits. The species appears to be dependent upon big sage and does not do well in its absence. The actual cause of the decline in the population is unknown but may be due to burning and heavy grazing that have resulted in removal of sagebrush.

Although the pygmy rabbit has not been identified on NTTR, several populations of big sagebrush are known to exist on the Kawich Range of the North Range. In fact, a pygmy rabbit scats and sign were observed at a spring in the Kawich Range during a recent helicopter survey. Pygmy rabbit habitat overlaps with sage grouse habitat, and the two could be easily surveyed together.

Western Burrowing Owl

The western burrowing owl (*Athene cunicularia*) is a species native to southern Nevada that adapts well to urban environments. Western burrowing owls are a former federal species of concern and are a protected species in Nevada (NAC 503.050). Western burrowing owls in southern Nevada may be summer residents, winter visitors, or year-round residents. Some are at least summer residents as demonstrated by July 1996 observations. Western burrowing owls were observed during daytime work on the sanitary landfill at the south end of the Base, where one adult was observed raising four young. They have also been observed along flood control channels on the southeast side of NAFB, the Live Ordnance Departure Area in Area II, and in Area III on the northwest side of the base.

Many individual western burrowing owls have been sighted in and around NAFB. They favor the flat, previously disturbed areas that are found around the southern boundary of NAFB, including the edges of concrete flood control channels, for the excavation of their burrows. Western burrowing owls have been sighted along the south perimeter of Area I during construction activities. In 1995, a western burrowing owl was observed on a Clark County Regional Flood Control District (CCRFCD) construction project adjacent to the Area I golf course. The burrow used by that owl was collapsed and two artificial burrows were established to the east of the site as mitigation. In 1996, maintenance of a CCRFCD channel within Area I disturbed two western burrowing owls, and four burrows were established in the southwest portion of Area I to comply with USFWS recommended mitigation. Also during 1996, western burrowing owls were discovered during landfill construction in the far southern extreme of Area I, south of the golf course. Because at least one adult was attending four young birds, construction activities

were diverted away from the area until all the young were fledged. Further surveys of the area, including investigation of the burrows with fiber optics, revealed that the burrowing owls had left the site, and construction activities continued. Recently, burrowing owl populations have been observed at the golf course, the Live Ordnance Departure Area in Area II, and Area III at NAFB (NAFB, 2004). With continued development of NAFB and the surrounding metropolitan areas, further effects on these birds are likely. Successful use of artificial burrows by western burrowing owls has been documented (Trulio, 1995) and is being considered as a management option by the USFWS in Las Vegas (Collins, 1996).

During biological surveys of the Creech AFB, formerly called Indian Springs Air Force Auxiliary Field, a western burrowing owl, and other sign thereof, was observed along the extreme northern boundary. No development is anticipated along this boundary, and so the owl or owls are unlikely to be affected by human activities. Any future development proposals at Creech AFB will take into account the potential for the occurrence of this bird.

Chuckwalla

The chuckwalla is a relatively large lizard that was formerly considered federal candidate for listing as threatened or endangered. The chuckwalla has been recorded on NAFB by the identification of diagnostic scat in the far eastern portion of Area II, where rocky hillsides are present. Chuckwallas emerge on warm mornings to bask until their body temperature reaches approximately 100°F, at which time they begin to forage on plants and fruits. Their coloring consistently includes a black head and forelegs, but the body colorings can be extremely variable among individuals, ranging from black to red to yellow. Females and juveniles may be banded. Females are thought to lay 5-10 eggs every other year. Chuckwallas are shy and extremely hard to catch due to their habit of wedging themselves in a rock crack and inflating their body with air, rendering them difficult to move.

A survey of the Indian Springs and Three Lakes valleys in the South Range of NTTR was conducted in 1994 to determine if chuckwalla inhabited the area (Dames and Moore, 1994). The study included Ranges 62, 63, 64, and 65. Of 54 sites surveyed, 52 contained chuckwalla sign usually in the form of scat. Additionally, two live chuckwallas were observed. The chuckwalla were found to prefer the rocky areas along the base of the mountains at elevations of 3000 to 4500 ft.

Banded Gila Monster

The banded Gila monster (*Heloderma suspectum cinctum*) is identified as a sensitive species by the BLM and is classified as protected by the state of Nevada. Currently the Clark County Multiple Species Habitat Conservation Plan classifies this species as an “Evaluation - High Priority.” Based on available information, this species has not been observed on NAFB or NTTR.

The banded Gila monster is found primarily in the Eastern Mojave Desert of southern California and southern Nevada and the northern Sonoran Desert in northern Arizona. The species is rare, but has been observed in southern Clark County. In this region the banded Gila monster is found primarily in the Mojave Desert Scrub, blackbrush, pinyon juniper, and desert riparian habitats. This species appears to prefer lower slopes of canyons, riparian habitats, and areas with large rocks and deep burrows, which it uses for cover. The banded Gila monster is one of the few venomous lizards in the world, and it feeds primarily on small mammals, birds, and eggs.

Phainopepla

The phainopepla, a passerine species (songbird), was designated by the State of Nevada as a protected species on April 3, 1997. Males are black, females are a dull gray, and both sexes have distinct red eyes. It is often found in mesquite groves and in washes that support significant stands of cat claw acacia, especially those that include heavy infestations of dwarf mistletoe (*Phoradendron californicum*). Mistletoe berries are its primary food source in such areas during winter. The rapid population growth and urban land development in and around Las Vegas has reduced habitat. Mesquite stands continue to be fragmented, degraded, and ultimately lost. The Desert Wells Annex contains large stands of mesquite with dwarf mistletoe and is expected to support phainopepla. This species is an evaluation species under the MSHCP, and no specific conservation or mitigation measures have been identified to date.

3.8 Cultural Resources

The INRMP proposes projects for wildlife management that are defined as Federal actions. Section 106 of the *National Historic Preservation Act of 1966* requires that Federal agencies take into account the effects of their undertakings on historic properties, and provides a process. The NAFB Cultural Resources Manager would have the lead for implementing field research and documentation review. The Area of Potential Effect (APE) is defined as the project area and any properties that could be impacted by exposure from the project. Efforts to identify and evaluate cultural resource properties would begin with a review of data by the Cultural Resources Manger and a recommendation for the need of field inventory. If no surface disturbance would be proposed, consultation would likely be the final step. If surface disturbance is proposed and the APE has been inventoried and subjected to consultation, this information would be documented in the EA and no further reviews would be necessary.

If surface disturbance is proposed and the APE has not been inventoried or if the results have not been subjected to consultation, a survey by a qualified archaeologist must be completed, Native American participation invited, a report composed, and the Commander's determinations forwarded for review by Native Americans and concurrence by the Nevada State Historic Preservation Office. If a no adverse effect determination would require avoidance of a site, a monitor may be necessary during construction. If a no adverse effect determination would require treatment to mitigate adverse effects, such as excavation and data recovery, the field research and a report would need to be reviewed under Section 106 consultation prior to implementation of the action.

3.9 Geology and Soils

Geology

The geologic formations outcropping on NTTR and NAFB can be divided into the southeastern area, which is mostly Paleozoic sedimentary rocks, and a northwestern area, which is dominated by volcanic rocks of the Cenozoic age (NBMG 1997).

NAFB lies in the Las Vegas Valley, which is predominantly sedimentary formations and alluvial deposits. The sedimentary formations are found in mountain ranges and consist mainly of limestone mixed with sandstone, shale, dolomite, gypsum, and interbedded quartzite. The alluvial fans found to the east and north of NAFB are composed of many coalescing fans dis-

sected by numerous drainage channels. In the upper reaches, these alluvial fans are comprised of poorly sorted gravelly, cobbly, and stony sand deposits that grade to finer textured material towards the valley floors. Basin floors are depositional areas of late-laid silt and clay and younger alluvial deposits. Most of these alluvial deposits have been transported by water and deposited on the sloping basin floors of the floodplains. The deposition of alluvium is a continuing process.

In NTTR, the mountain ranges in the South Range are dominated by Paleozoic carbonate rocks mixed with smaller amounts of quartzite, sandstone, and shale. Valleys in this area contain thick deposits of alluvium originating from erosion of adjacent mountain ranges. Sedimentary rocks originating from lakes and rivers have been deposited in shallow basins and outcrop in several areas within NTTR, particularly in the southern Spotted Range, the Pintwater Range, and the Desert Range. Older Tertiary valley-fill sediments which were uplifted with the underlying Paleozoic bedrock are exposed on the flanks of the mountains (Longwell et al. 1965; NBMG 1997).

Volcanic rocks dominate the geology of the northern ranges. The Timber Mountain caldera is one of several centers of volcanic activity in the northern range. Other such centers include the Black Mountain, Cactus Range, and Silent Canyon calderas, and Mount Helen dome. Volcanic tuff originating from the volcanic centers extends throughout the North Range including the extensive tableland of western Pahute Mesa, the southern Cactus and Kawich Ranges, and Stonewall Mountain (Cornwall 1972 and NBMG 1997).

Most of the faults at NTTR and NAFB are a result of regional thrust, folds, and wrench faults developed during compressional deformation associated with mountain building, which rearranged the position of sedimentary rocks in southern Nevada. A more detailed discussion of faults in southern Nevada can be found in Armstrong (1968) and Caskey and Schweickerty (1992). The western one-third of NTTR is located within Seismic Zone 3, while the eastern two-thirds of NTTR and NAFB are located in Seismic Zone 2B. Seismic Zone 3 is considered an area with major damage potential, while Seismic Zone 2B is considered an area of moderate damage potential. The Yucca fault, located in the south-central portion of NTTR, is the only fault that is considered active based on displacement of surface alluvium. Other active faults may also occur on NTTR. Several inactive or potentially active faults are also present at NTTR. These faults include the Carpetbag fault located west of the Yucca fault and the Pahranagat fault system located in the South Range. Most faults on NTTR and NAFB are considered inactive.

Mineral Resources

The Department of the Air Force, per Public Law 106-65, Military Lands Withdrawal Act of 1999, Subtitle A, Section 3011(b)(1), declares that the lands under the Nevada Test and Training Range are closed to public access. They are specifically withdrawn from all forms of appropriation under the mining laws, the mineral leasing laws, and the geothermal laws. The Air Force has no lands suitable for these activities and will continue to enforce current public access policy. According to PL 106-65 as amended, the Secretary of the Interior must determine, at least every five years, whether it is suitable to open any withdrawn lands for mineral resource entry. The intent of this decision is based on three factors: (1) to protect the public from injury due to ordnance hazards; (2) to ensure national security is not compromised; and (3) to ensure that military programs can be conducted without interruption.

The NBMG conducted rather extensive studies of mineral resources that have been discovered on NTTR. As part of the project, NBMG mapped areas potentially containing various mineral resources including precious metals, metallic minerals, and non-metallic industrial minerals. The study is well documented in NBMG (1997) and summarized in Air Force (1999). Resource managers requiring detailed information on mineral resources should refer to those references.

NTTR had been mined since the 1860s. Most of the gold and silver deposits were discovered and mined in the early 1900s, although some mining efforts occurred sporadically until 1942, when NTTR was closed to mining. With the exception of the Groom Mountain Range, little or no mineral exploration or related activity has been allowed in the last 50 years. This particular area contains one unpatented mining claim, 16 patented mining claims, and all or portions of two oil and gas leases. Minerals discovered at NTTR include gold, silver, copper, lead, zinc, mercury, tungsten, and turquoise. In addition, commercial grade sand, gravel, and limestone are also found in NTTR. Potentially valuable deposits of sodium, potassium, alunite, and potash also occur in NTTR. Significant deposits of gypsum and limestone have been produced from areas adjacent to NTTR and NAFB.

Soils

The NRCS has currently mapped most of the soils on NAFB. The exception to this is those soils located in the eastern half of Area II of NAFB as well as those soils found in and around Sunset Mountain. Most of the soils at NAFB are alluvial soils produced by erosion and wash of soils from surrounding mountains. This is very common in the basins in and around the Las Vegas Valley. A majority of the soils in Area III contain relatively high levels of gypsum, which provides an environment conducive to the growth of the Las Vegas bearpoppy and the Las Vegas buckwheat. Other areas containing gypsum soils are scattered throughout NAFB and may also support these plants.

In the vicinity of NAFB proper, tectonic activity has been less than in areas closer to the mountain fronts. Tertiary and early Quaternary valley fill lies at shallow depth. The upper soil layer on the NAFB is light brown sandy loam with gravel and clay-rich sand. The average depth of topsoil ranges from 15 to 60 cm. Below 60 cm are strata of caliche, which are often impenetrable to water and physical disturbance. The topsoil is loose and dry silt in some areas. Internal drainage is normally good above caliche strata, but poor at and below that point. Soil in this area is subject to extreme wind erosion due to sparse vegetation and seasonal high winds. Where required, erosion can be minimized by the use of dust palliatives and cultured vegetation. Alkalinity may be a problem for some plantings. However, a lower pH can be established by the application of soil amendments as recommended by the manufacturer.

The alluvial soils that are commonly found in fans and basins often contain very fine soil particles that can be subject to wind erosion. This creates fugitive dust issues, which can be accentuated by off- and on-road vehicular traffic and loss of topsoil caused by construction or wildlife grazing activities.

In general, soils found on NAFB are one of three associations:

- Glencarb association: Very deep soils found on floodplains and along alluvial fans.
- Weiser-Dalian association: Very deep soils found on alluvial fan remnants, fan skirts, and inset fans. Other than their droughty nature, the limiting factors for these soils primarily associated with their susceptibility to wind erosion. Water erosion is mainly a

problem in drainage areas and only occurs following intense storm events.

- Cave-Las Vegas-Goodsprings association: Shallow and very shallow soils found on alluvial remnants.

In general, soils of the South Range are predominantly alluvial soils derived from carbonate parent material. Because the North Range receives substantially greater effective moisture, and because the soils there are developed largely on volcanic parent material, the A horizons are typically better developed. They frequently possess a noticeable organic component in relatively dense scrub and woodland habitats. The B horizons, as in the South Range, have a cumulic character due to the substantial influx of silt and clay-sized particles. Carbonate horizons are commonly developed in the older parent material, with most carbonate originally coming from dust.

The soils on NTTR have not been mapped in detail; however, soils associations have been mapped by the NRCS using satellite photography and other sources. These maps are available through the NRCS via the Internet using the SURGO soil mapping site. More specific soils for portions of NTTR can also be found on the STATSGO Internet site, but most of NTTR has not been mapped at that level of detail. General soil associations found on NTTR include the following:

- St. Thomas series: This soil is primarily shallow, well drained, and formed in colluvium and residuum from limestone and dolomite. These soils are primarily found in the mountainous areas, on hills, and mountains with 8 to 75 percent slopes.
- Crosgrain series: This soil is found on alluvial fan piedmonts and is a shallow, well drained soil formed in mixed alluvium on older fan piedmonts with slopes of 4 to 30 percent.
- Arizo series: This soil is also commonly found on fan piedmonts but are very deep, excessively drained soils formed in mixed alluvium on more recent alluvial fans with slopes from 0 to 15 percent.
- Mazuma series: Very deep, well-drained soils that formed in alluvium and lacustrine materials from various rock sources. These soils commonly occur on fan skirts and alluvial flats with slopes of 0 to 15 percent.
- Ragtown series: Very deep, moderately well drained soils formed in moderately fine and fine-textured lacustrine materials, also from mixed rock sources. This soil is commonly found on lake plain terraces with slopes from 0 to 4 percent.

3.10 Parks, Natural Areas, and Wilderness Areas

Several protected natural areas exist in the vicinity of NAFB and NTTR (Figure 2.5). The most prominent natural preserve in the vicinity is the DNWR, which is managed by the USFWS. Part of this facility is a jointly managed area of 826,000 acres within the boundaries of the South Range. The entire DNWR encompasses approximately 1,500,000 acres. That portion of the DNWR encompassing the Sheep Range, northern Las Vegas Range, and the North Desert Range, is managed by the DNWR as a Wilderness Study Area. Public access to the DNWR is through two roads originating at the USFWS Corn Creek Field Station approximately 23 miles north of Las Vegas, east of U.S. Highway 95. A primary mission of the DNWR is to manage and maintain habitat for desert bighorn sheep.

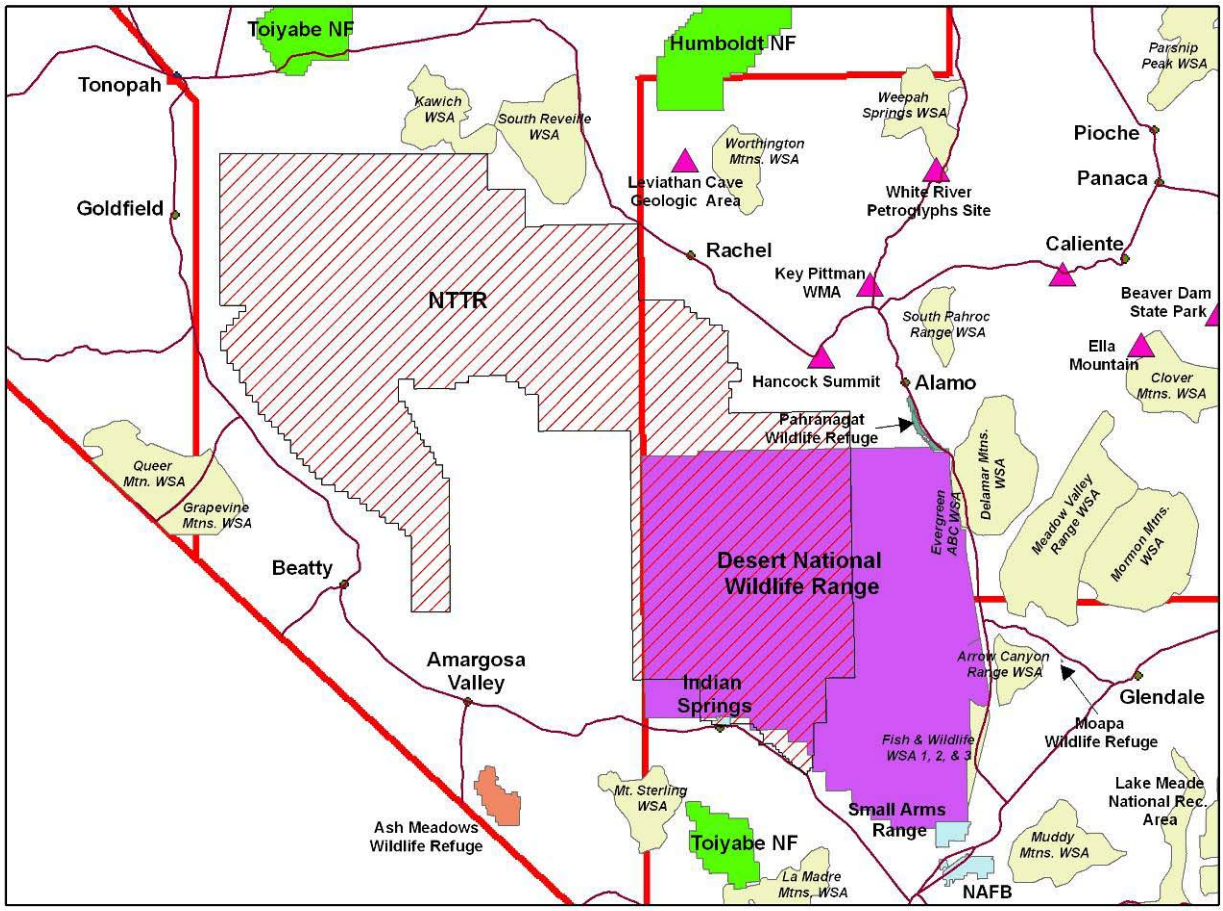
The DNWR is part of USFWS's Desert National Wildlife Refuge Complex (DNWRC). The DNWRC manages three additional preserves: the 5,500-acre Pahranagat National Wildlife

Refuge (NWR); the 33-acre Moapa Valley NWR east of the NTTR in Lincoln and Clark counties; and the 13,000-acre Ash Meadows NWR in Nye County to the west (Figure 3.11). Together, the four refuges protect a broad range of native plant, invertebrate, and vertebrate species, some of which are endemic to this region alone. Lists of rare species protected by the DNWR are available from the USFWS.

In addition, the permanent lakes and marshes of the Pahranagat NWR are an important link in the Pacific flyway for birds migrating between their summer and winter habitats. The three smaller units of the DNWR provide unique aquatic and wetland habitats for plants and animals that are rare or non-existent on NAFB and NTTR. Several Wilderness Study Areas are also located near NTTR and NAFB and are shown in Figure 3.11. These areas are used to research various aspects of natural resources and their management.

To the west of the NTTR and U.S. Highway 95, within Clark and Nye counties, lies the Spring Range, administered by the Toiyabe National Forest, U.S. Forest Service (USFS). In August 1993 Congress directed USFS to develop a multiple use plan for this 316,000-acre area, to be known as the Spring Mountains National Recreation Area (SMNRA) (Figure 3.11). The SMNRA is adjacent to the Red Rock Canyon National Conservation Area, managed by the BLM, which is of approximately equal area. The highest peak in the northeastern Mojave Desert of Nevada, Mt. Charleston, is in the SMNRA. This 11,920 ft peak overlooks an important natural area with ponderosa pine forests and deep canyons that provides habitat for many plant and animal species. Some of the same vegetation can be found in the Sheep Range and on the NTTR at comparable elevations, but the Spring Range is typified by a greater number of higher elevation habitats where distinct vegetative communities are found. Adjacent to NAFB to the southeast lies the 1,500,000-acre Lake Mead National Recreation Area (NRA), administered by the U.S. National Park Service (NPS). As the nation's first Recreation Area, it is shared by Nevada and Arizona and includes two reservoirs on the Colorado River, the 100-mile long Lake Mead, and the 68-mile long Lake Mohave. A multitude of recreational opportunities not found on NAFB or NTTR, including swimming, boating, fishing, camping, picnicking, and wildlife viewing, are available in and along the lakes. Lake Mead NRA is also a stopover in the Pacific flyway for migrating birds (Figure 3.11). Finally, the Timber Mountain Caldera National Landmark is present on NTS near Range EC South.

Figure 3.11. Parks and natural areas located in the vicinity of NAFB and NTTR.



3.11 Socioeconomics

A thorough review of the socioeconomics of NTTR is provided in USAF, 1999. In general, impacts to socioeconomics from any of the alternatives are considered minor and will not be discussed any further.

3.12 Environmental Justice

On February 11, 1994, President Clinton issued Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*. The purpose of the order is to avoid the disproportionate placement of adverse environmental, economic, social, or health impacts from federal actions and policies on minority and low-income populations. The first step in the process is to identify minority and low-income populations that might be affected by implementation of the Proposed Action or No-Action Alternative. It is the critical step in addressing environmental justice. The proposed action for this EA would not impact any low income or minority populations. Therefore, Environmental Justice is not an issue and will not be further discussed in this EA.

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 Land Use

Proposed Action. Under the Proposed Action, land use would be restricted by federal regulations and INRMP recommendations. In general, the INRMP recommendations would have only minor impacts on land use. Private development of land is not allowed by the mission; thus, natural resources are protected from urban development. Although the INRMP recommends some isolated land use to accommodate conservation of natural resources, mission requirements take precedence over those recommendations.

Alternative Action A. Land use would be restricted only by federal regulations and not by INRMP recommendations. The BLM RMP Record of Decision allows the Secretary of the Interior to issue easements, lease, rights-of way, or other authorizations, but only with the approval of the Secretary of the Air Force.

No-Action Alternative. The current INRMP provides more guidance on land use compared to Alternative A. However, the level of conservation would be less than that imposed by the Proposed Action.

4.2 Noise

Proposed Action. The Proposed Action is not expected to impact noise.

Alternative Action A. No impacts to noise levels at NAFB and NTTR are anticipated as a result of Alternative A.

No-Action Alternative. No impacts to noise are anticipated as a result of the No Action Alternative.

4.3 Air Quality

Proposed Action. The Proposed Action is not anticipated to impact air quality.

Alternative Action A. No impacts to air quality as a result of Alternative A are anticipated.

No-Action Alternative. No impacts to the air quality are anticipated under the No Action Alternative.

4.4 Water Resources

Surface Water

Proposed Action. The revised INRMP requires baseline data, which identifies all surface waters of the U.S. potentially falling under the jurisdiction of the USACE. Because of this, potential issues and violations involving these waters could be avoided. Springs, seeps, and other surface waters are conserved by the INRMP

guidelines, and these guidelines require that 99th CES/CEVN coordinate with BLM to construct fences to protect these springs from grazing horses. Because of the presence of a comprehensive surface water database, the potential for delays to mission plans due to identification of these surface waters is possible. However, with proper planning, delays can be prevented by avoidance of impacts to surface waters, thus avoiding permit requirements under Section 404 of the Clean Water Act.

Under the revised INRMP, ephemeral streams are afforded more conservation, and degradation of stream channels and vegetation along the stream channels would be minimized. Finally, the potential for erosion damage along roads and pipelines would be minimized by compliance with guideline recommendations and use of best management practices.

Alternative Action A. Because of the lack of accurate baseline data, infractions and violations of Section 404 could occur. Delays caused by Section 404 issues may be reduced due to the fact that the locations of jurisdictional waters have not been established and may have been overlooked by the Air Force and the USACE. Additionally, more impacts to streams may occur due to the lack of identification.

No-Action Alternative. Similar to Alternative A, violations of Section 404 of the Clean Water Act could occur due to the lack of baseline data on surface waters of the U.S. This alternative could also result in continued degradation of vegetation due to the fact that the current INRMP does not provide guidance for management of springs. Because of the lack of baseline data, the effects of activities on those surface waters are unknown.

Wetlands

Proposed Action. The Proposed Action requires construction activities of the mission to be reviewed by 99 CES/CEVN for potential impacts to surface waters of the U.S., especially wetlands. The INRMP not only recommends conservation of jurisdictional wetlands, but also, where practicable, isolated wetlands because of their rare occurrence on NTTR and the fact that they often support species of concern. This level of conservation also allows for early identification of the need for Section 404 permitting, which would definitely prevent excessive delays for mission projects. Further, the Proposed Action provides coordination with BLM to ensure protection of wetlands from grazing wild horses.

Alternative Action A. This alternative does not provide any means to identify Section 404 permit requirements early in the process by use of a database or other sources. Identification of a 404 permitting requirement for filling of wetlands has a higher potential to delay or even stop mission activities. Thus, this alternative does not provide the level of conservation for isolated wetlands that is afforded by the proposed action. However, it is recognized that most wetlands on NTTR are isolated and are probably not protected by current Section 404 regulations.

No-Action Alternative. The current INRMP recommends conservation of isolated wetlands based on their importance in the ecosystem. However, information on the location and characteristics of these wetlands is incomplete and would not be readily available to planners, resulting in late identification of potential Section 404 permitting requirements which would delay or even stop mission activities. The current

INRMP also does not address the coordination with BLM to prevent degradation of wetlands by wild horses.

Groundwater

Proposed Action. The revised INRMP identifies the fact that regular monitoring of groundwater quality through sampling of springs, seeps, and wells is currently being assessed by other federal agencies including USGS, NDOW, and USFWS. The INRMP requires this information to be inputted into the natural resource database. Regular monitoring activities ensure that contamination potentially caused by mission activities or activities outside of NTTR can be detected early. Thus, the proposed action helps to ensure conservation of groundwater resources similar to the other alternatives. Unlike the BLM RMP and MOU, the INRMP requires location and identification of sensitive recharge features, which also protects groundwater resources.

Alternative Action A. Alternative A would also continue monitoring of water quality of groundwater by USGS, NDOW, and USFWS. However, impacts to recharge features could potentially go unchecked due to lack of a monitoring or conservation program.

No-Action Alternative. Impacts caused by the No Action Alternative are the same as those of Alternative A.

Floodplains

Proposed Action. The Proposed Action requires that current floodplain maps be reviewed for accuracy and incorporated into the natural resource database for use by NTTR and NAFB planners and managers. Thus, during the early planning of mission activities, especially construction, floodplain boundaries could be readily identified and impacts to flood-sensitive activities could be prevented. Impacts to flood flow and storage would be minimized or avoided and proper mitigation to compensate for the impacts could be implemented.

Alternative Action A. Floodplain information is currently available in GIS for NTTR and NAFB. The accuracy of the existing floodplain mapping is questionable for NTTR, and erroneous information could result in a higher potential for impacts to flood-sensitive activities of the mission.

No-Action Alternative. Under the current INRMP, floodplains would continue to be inaccurately mapped, resulting in impacts similar to those of Alternative A.

4.5 Flight Safety

Proposed Action. The Proposed Action is not expected to impact flight safety. All helicopter surveys will be scheduled with 98th RANW and compliance with air space restrictions will be strictly enforced.

Alternative Action A. Alternative Action A would have no effects on flight safety.

No-Action Alternative. The No-Action Alternative would have no effects on flight safety.

4.6 Vegetation

Proposed Action. The revised INRMP recommends that NTTR and NAFB be subjected to vegetation mapping and incorporation of that data into the natural resource database. This would allow for more efficient planning for mission actions to avoid or minimize environmental issues that could potentially delay mission activities. The fact that the revised INRMP recommends aerial photography of NTTR and NAFB every five years allows for early detection of changes in vegetation that may be subtle or unnoticed at ground level. This would afford further conservation for those areas that are not frequented by military and civilian personnel.

The INRMP also provides guidance to allow for rapid recovery of vegetation from impacts, thus decreasing overall impact of mission activities on vegetation. Revegetation of areas following impacts is recommended by the INRMP and would result in more rapid recovery of areas following impacts compared to natural revegetation. The current biological assessment for NTTR requires areas to be revegetated for desert tortoise. The INRMP provides for the development of new habitat for desert tortoise in response to this requirement.

The revised INRMP also requires monitoring of range utilization by use of exclosures. This practice would prevent degradation of plant communities and allow for early detection of exceedances in horse population size on the North Range. Again, impacts to vegetation communities and species of concern would be diminished.

Guidelines within the revised INRMP recommend avoiding or minimizing impacts to riparian and spring vegetation because of their importance in the desert ecosystem. Thus, positive impacts for these plant communities would be realized.

Alternative Action A. Alternative A does not provide for mapping of vegetation communities, thus potential impacts to sensitive species and the overall ecosystem are much more likely. The BLM RMP reflects a need to complete a vegetation inventory, as without inventory of the vegetation the current ecologic condition of the vegetative associations cannot be assessed or future condition changes tracked. The BLM RMP manages for potential natural communities, which can only be done by first having a soil survey completed and then using the soil survey to assess vegetation inventory and, in turn, the ecological condition of the area. Guidelines for restoring vegetation communities following mission impacts are recommended by this alternative when feasible. Aerial photography is also not required by this alternative and detection of any changes in remote areas would be difficult, if not impossible. Alternative A requires monitoring of the range condition by BLM according to the BLM RMP.

No-Action Alternative. Mapping of vegetation is recommended by the current INRMP but has not been implemented to date. The no action alternative also provides some guidance for restoring of vegetation, but basically relies on natural recovery following impacts. Therefore, it would be expected that vegetative communities would recover at a much slower rate than that of the proposed action.

Aerial photography is not required by the current INRMP, thus this tool would not be available for monitoring of remote areas and detection of subtle changes in vegetation. The No Action Alternative requires monitoring of range condition, but implementation of this recommendation has not occurred to date, and degradation of habitat would be anticipated. Last, the current INRMP does not address conservation of riparian and spring vegetation, so the potential for degradation of these important biotic features would be high.

4.7 Wildlife

Proposed Action. The revised INRMP recommends bat surveys to identify and map bat habitat so that impacts to sensitive bat populations could be avoided or minimized. Significant bat populations located near air fields could be identified to minimize BASH issues. This could be accomplished by having the bats removed. Several species of bats that are rare or species of concern could be inhabiting NAFB and NTTR. Extensive surveys recommended by the INRMP could identify and locate those species, preventing further degradation of the populations and possible permit issues.

The Proposed Action also provides guidelines for surveying water fowl and raptors. This practice also could minimize the potential for BASH. Further, identification of raptor nests would prevent delays to mission activities due to violations of the Eagle Protection Act. Therefore, the Proposed Action provides a higher level of conservation for raptors.

Reptile and amphibian surveys recommended by the revised INRMP could result in conservation of populations of these species. Species of concern could be identified and protected also. The revised INRMP affords more guidance for the conservation of small mammals, resulting in less impacts by the mission to those species.

The revised INRMP recommends that the BLM carefully monitor wild horse populations. Monitoring of wild horses by the BLM is somewhat difficult due to the fact that access to the range is not free and open and must be restricted to ensure the military mission is not impacted and to protect personnel from harm. The 1971 Wild Free-Roaming Horses and Burros Act, as amended, requires BLM and the Forest Service to manage wild horses and burros at the minimum feasible level. Monitoring of horse populations will improve the health of horses on NTTR and also minimize degradation of vegetation as a result of overgrazing by wild horses. Vegetation at watering areas would also be conserved. The revised INRMP also affords monitoring of the wild horse population, resulting in improvement of range conditions. Impacts to unique riparian habitat would be less than other alternatives due to additional monitoring by NAFB to assist BLM in that effort. Cooperative work between BLM, NDOW, and USAF would result in more intensive management of wild horses to ensure that range utilization goals are met.

All of these tasks recommended by the Proposed Action would possibly result in a decrease in BASH incidences and a decrease in the potential for vehicle accidents with horses due to a decrease in their population.

Impacts of mission action on large mammals would possibly be decreased by the Proposed Action due to a better understanding of the movement and location of

herds. Additionally, the overall health of large mammal herds could be improved due to close monitoring of populations, allowing for population management when and where necessary. More careful monitoring of wild horse populations would result in improved habitat for other large mammals.

Alternative Action A. Because of the lack of surveys to identify and map bat habitat, potential impacts to species of concern could occur, resulting in violations to the Endangered Species Act if those species are listed. The lack of management could also result in continued degradation of populations, potentially causing the listing of the species. Also, potential BASH issues could occur due to the fact that bat populations in and around airfields would not be located or identified. The BLM RMP protects raptors and raptor habitat. No conservation or management of other birds is recommended in the BLM RMP. Thus, the potential of BASH incidences associated with other bird species is higher with this alternative versus the others.

Under Alternative A, BLM's objective in the BLM RMP is to "manage habitats for non-listed special status species to support viable populations so that future listing would not be necessary." The BLM RMP directs collection of specific data, but does not exclude additional inventories, which could include reptile and amphibian studies. However, without the revised INRMP, those inventories will probably not be completed. This could become an issue if any of the species of concern are inadvertently impacted by mission activities and violations to ESA occur.

Few direct adverse impacts of Alternative A on mammals and wild horses are anticipated. Basically, the BLM would continue to monitor and manage horse populations. Alternative A provides for conservation of vegetation around watering areas because the BLM RMP allows for continued degradation of riparian resources.

Alternative A does not actively manage bird and bat habitats and populations to decrease the number of BASH incidents. Under the BLM RMP, the BLM does not restrict horse movements within the HMA and does not actively manage to reduce vehicle incidents with horses.

Alternative A would possibly result in no change in the level of impacts anticipated from mission actions with respect to large mammals. Some improvement in overall herd health would be anticipated. Some degradation of herds could occur due to less extensive management of the habitat.

No-Action Alternative. The no action alternative would result in impacts similar to those realized by Alternative A. Implementation of the BLM RMP would have positive impacts and would provide some conservation measures for natural resources. However, those measures would not be as intense as the Proposed Action because of additional assistance through the 99th CES/CEVN The current INRMP recommends bat surveys at water sources and roosts, which would alleviate some of the impacts to those animals. Bat populations along airfields are not surveyed in the current INRMP allowing for potential BASH issues to occur.

The current INRMP recommends bird surveys annually which would assist in the identification of species of concern and possibly decrease BASH incidences. No emphasis on raptors is included in the no action alternative. Thus, raptor nests and populations would not be identified and located. This would increase the potential for

mission actions to result in a violation of the Eagle Protection Act. This would identify potential BASH problems and any species that are protected by the Migratory Bird Treaty Act.

The no action alternative does not allow for identification of reptile and amphibian populations, which could result in impacts to populations. This could become an issue if any of the species of concern are inadvertently impacted by mission activities and violations to ESA occur.

The current INRMP does not address wild horse issues and would rely on the BLM to manage populations similar to alternative A.

Impacts imposed by the No Action Alternative on large mammals would be the same as those imposed by Alternative A.

4.8 Threatened and Endangered Species

Proposed Action. Under the revised INRMP, close coordination with the USFWS and implementation of the desert tortoise management plan would result in minimizing the need for Section 7 consultation when tortoise habitat is impacted by mission actions. Also, mapping of potential habitat for desert tortoise would allow for the opportunity of the mission to completely avoid impacts and consultation. Implementation of the desert tortoise management plan as recommended by the revised INRMP would also expedite any Section 7 consultation that may be required. As a result of recommendations implemented by the revised INRMP, tortoise conservation would be improved, decreasing the potential for inadvertent "takes."

Alternative Action A. Under Alternative A, desert tortoise habitat would continue to be identified on a case-by-case basis as projects are implemented. Section 7 consultation would be required for every project in the South Range and NAFB, causing significant delays in mission action. The BLM RMP provides less extensive surveying of desert tortoise habitat, which would possibly result in a higher potential for "takes" compared to the Proposed Action.

No-Action Alternative. Impacts imposed by the No Action Alternative would be the same as those for Alternative A.

4.9 Species of Concern

Proposed Action. Under the Proposed Action, populations of sensitive species would be expected to increase because more habitat would be identified and protected. This is especially true for the Las Vegas bearpoppy and rare plants identified in NTTR. Implementation of mapping and management of the burrowing owl would also result in fewer impacts to these species. Sage grouse and pygmy rabbit populations would benefit from the Proposed Action because of additional conservation and identification of habitat. The banded gila monster, chuckwalla, and phainopepla would all be afforded more extensive conservation measures by the proposed action due to more intensive surveys and monitoring of these species.

Alternative Action A. Alternative A allows for conservation of the Las Vegas bearpoppy, but no real active management of populations. Physical impacts to estab-

lished populations by mission actions could result. The BLM RMP only affords minor management of rare plants. Similarly, burrowing owl habitat could be impacted due to lack of identification and mapping of populations. Though not identified with specific management direction, the BLM RMP does not preclude it. The special status species objective directs the BLM to manage special status species habitat. Chuckwallas, burrowing owls, banded Gila monsters, sage grouse, bearpoppy, etc. are all BLM sensitive species and fall under this umbrella. However, the level of management is impacted by access and funding. The revised INRMP provides for additional assistance from 99th CES/CEVN. Therefore, impacts to these species could occur due to lack of information on their distribution across NAFB and NTTR that would be provided under the revised INRMP. The BLM RMP recommends minimizing impacts to sage grouse habitat, but does not provide a means to identify or map the habitat. The BLM RMP does not specifically address pygmy rabbit habitat. Some conservation of both species is provided, but not at the level provided by the Proposed Action or the No Action Alternative.

No-Action Alternative. Under the No Action Alternative, populations of Las Vegas bearpoppy should increase due to additional mapping of habitat and the fact that habitat is currently being protected. The current INRMP provides some guidance for the burrowing owl, phainopepla, chuckwalla and banded gila monster. No guidance is provided for sage grouse or pygmy rabbit. The potential for impacts to these species is higher than for the proposed action.

4.10 Military Mission

Proposed Action. The Proposed Action (INRMP) would support the military mission while conserving NAFB and NTTR natural resources. In fact, it would ensure that

sion activities due to violations of federal regulations under this alternative would be less than that of Alternative A , but greater than that of the Proposed Action.

4.11 Geology and Soils

Geology

Proposed Action. Baseline information on geologic formations and outcrops would be in place under the Proposed Action and would allow mission planners to determine sites for facilities and activities that do not impact sensitive geologic structures, where practical. This information also can be used to minimize potential of placing these facilities in areas where faults or weak strata may be present, preferably preempting a portion of the more costly on-site geotechnical investigations. The proposed action would not only protect sensitive geologic features, but would serve to provide more safety for the military mission, where practical.

Alternative Action A. Under Alternative A, guidance for conservation of geologic features on NAFB and NTTR would be lacking. Current federal regulations do not provide a great deal of protection for geologic features with the exception of recharge zones. Additionally, no real guidance is provided for road and facility construction. Without baseline information and guidance for sensitive geologic features, unintentional impacts to those geologic features could result. Further, more initial geologic studies would be required for facility siting construction, since information would have to be acquired on an individual site basis in contrast to range-wide information being available under the new INRMP. Facilities and roads could also be impacted by being sited in areas that overlie faults or may lie on weak strata subject to subsidence or landslides.

No-Action Alternative. The BLM RMP does not contain management guidelines for the conservation of geologic, topographic, or physiographic features. This is especially important because the potential for impacts to sensitive geologic features is higher due to the lack of this baseline information. As with Alternative A, facilities and roads could be impacted by placement in areas overlying faults or weak strata that may not have been detected or found prior to construction.

Soils

Proposed Action. The baseline data that would be collected for the INRMP would definitely improve the potential for proper siting of facilities and mission activities in areas where soils would not present adverse impacts to the mission and where the mission would not impart impacts to soils, where practical. Additionally, the soils database could provide assistance in identifying and avoiding potential habitat of species of concern early in the planning process. This in turn would avoid costly delays in design and construction. A comprehensive soils database also would assist 98 RANW in identifying specific locations for targets and training areas that mimic environments in war zones.

Alternative Action A. Baseline data on soils would not be available for areas of the North Range outside of the Horse Management Area and all of the South Range. This could result in siting of facilities on soils that may impact the facility or the mis-

sion. Additionally, the BLM RMP does not provide sufficient guidance on soils, which again indicates that potential habitat for species of concern may not be identified after design and construction has been initiated. However, the BLM RMP does require erosion control in watersheds, which would protect surface waters from sedimentation.

No-Action Alternative. The current INRMP does not request collection and documentation of baseline soils data for areas outside of those currently being mapped by BLM. Therefore, facility sitings may require additional initial studies to determine the nature of soils in the area and their potential impact on the facility. Soils potentially supporting endangered and threatened species may not be initially identified, resulting in the discovery of endangered or threatened species after design and construction have begun. This can result in costly delays during the consultation process with the USFWS. Worse, mission activities could impart impacts on those sensitive species, resulting in enforcement action by the USFWS.

Mineral Resources

Proposed Action. Good baseline data is currently available for use in resource management of minerals and energy resources at NTTR and NAFB. Extraction of minerals on NTTR is prohibited. Also, removal of aggregate at NTTR and NAFB is adequately regulated and sufficiently monitored. The new INRMP requires that mineral resource data be incorporated into the GIS database. This would provide a more readily available source of information for planners and managers as compared to the other two alternatives. Additionally, the INRMP recommends that the resource manager provide aggregate use data on an annual basis to the BLM.

Alternative Action A. Alternative A would be similar to the Proposed Action with the exception that no oversight by 99th CES/CEVN would be required, and data would not be available to planners in the GIS database.

No-Action Alternative. The No Action Alternative would be similar to Alternative A because the current INRMP does not require or recommend oversight for resource management of minerals and energy resources. Similarly, this alternative does not include development of a GIS database for use by managers and planners of the mission.

4.12 Wilderness Areas

Proposed Action. The Proposed Action would have no impacts on the DNWR. Activities at the DNWR must be reviewed by the USFWS for any actions occurring above 4000 ft. elevation MSL in Three Lakes Valley on the South Range and above 3600 ft. MSL in Indian Springs Valley on the South Range.

Alternative Action A. An MOU with the USFWS states that mission activities in this area at 4000 ft. MSL and higher must be reviewed by the USFWS for impacts to the DNWR.

No-Action Alternative. The No Action Alternative would have the same impacts to the environment as Alternative A.

4.13 Cultural Resources

Impacts imposed by all three alternatives would be the same due to the fact that cultural resources are currently protected through the current NAFB Integrated Cultural Resources Management Plan.

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5.0 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible and irretrievable resource commitments are defined as the use of non-renewable resources and the effects that the uses of these resources have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource, such as fossil fuels or minerals, that cannot be replaced within a reasonable period. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action, such as an archaeological site.

Proposed Action. An insignificant amount of irreversible resource commitments and no irretrievable resource commitments would be required for the proposed action. Irretrievable resources necessary to accomplish the proposed action would primarily be fossil fuels for transporting personnel for surveys, but these would be minor volumes.

Alternative Action A. Under Alternative Action A, less use of fossil fuels would occur due to a lower level of surveying and monitoring compared to the Proposed Action.

No-Action Alternative. Under the No-Action Alternative, the use of fossil fuels would be similar to that of Alternative Action A.

5.1 Cumulative Impacts

Cumulative impacts are defined as the incremental impact of actions when added to other past, present and reasonably foreseeable future actions, regardless of which agency (Federal or non-Federal or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR §1508.7). Cumulative impacts are impacts on the environment that result from incremental impacts that occurred in the past, present, or will occur within the reasonable foreseeable future. Cumulative impacts may also include similar impacts occurring in a location that is relatively close to the project area. An impact may be insignificant or small individually, but may be significant when added to several other impacts.

Proposed Action. Most of the impacts caused by the Proposed Action are not cumulative due to the lack of any similar actions in the area. Positive cumulative impacts would occur because of the improvements in the environment afforded by each of the alternatives. Improvements to plant communities and the health of wildlife populations would be cumulative with other efforts on state and federal lands surrounding NTTR and NAFB. Closer coordination with BLM for management of the wild horse population would have a positive impact on the environment and would decrease the potential for degradation of habitat which would be a positive cumulative impact of horses on NTTR and the area surrounding NTTR. Other positive cumulative impacts include providing a better regional understanding of ecosystems in Nevada by additional knowledge of migration corridors to fill in the gaps currently in the state database, identification of tortoise habitat at the northern extent of their range in NTTR, identification of sage grouse habitat characteristics at the southern extent of their range in NTTR, identification of pygmy rabbit habitat in the North Range of NTTR, and an understanding of the role of the NTTR and NAFB ecosystems in the natural resources continuum across the southwestern U.S.

Alternative Action A. Some positive cumulative impacts to the ecology of the area would occur with Alternative Action A, but to a lesser degree than the Proposed Action due to less intense surveying and monitoring.

No Action Alternative. Cumulative impacts would be similar to that of Alternative Action A.

5.2 Unavoidable Adverse Impacts

No unavoidable adverse impacts are expected from the implementation of the Proposed Action or the alternative actions.

5.3 Irreversible and Irretrievable Commitment of Resources

In some cases, an action may cause irreversible damage or result in the ultimate loss of a particular resource. However, the Proposed Action and all alternatives do not result in an irreversible or irretrievable commitment of resources.

5.4 Relationship Between Short-Term Uses of the Human Environment and Maintenance of Long-Term Productivity

Actions that improve vegetation health and conditions result in the long-term productivity of the resource. The Proposed Action requires close monitoring of wild horse populations, which would result in a significant improvement of range productivity over time. The other two alternatives would also improve habitat, but not to the extent expected from the proposed action due to more intensive habitat management required by the Proposed Action.

LITERATURE CITED

Armstrong, R. L. 1968. Sevier Orogenic Belt in Nevada and Utah. Geological Society America Bulletin 79(4): 429-458.

Bair, J. 1997. U.S. Fish and Wildlife Service, Reno, Nevada. Personal communication.

Beatley, J. C. 1976. *Vascular plants of the Nevada Test Site and central-southern Nevada: Ecologic and geographic distributions*. Technical Information Center, Energy Research and Development Administration.

Bradley, W. G., and J. E. Deacon. 1967. The biotic communities of southern Nevada. *In*: *Pliestocene Studies in Southern Nevada.* Nevada State Museum Anthropological Papers, edited by H. M. Wormington, and D. Ellis. Nevada State Museum, Reno, Nevada.

Brown, D. E. (ed). 1982. Biotic Communities of the American Southwest - United States and Mexico. *Desert Plants*. 4:1-4.

Caskey, S. J. and R. A. Schweickerty. 1992. Mesozoic Deformation in the Nevada Test Site and Vicinity: Implications for the Structural Framework of the Cordilleran Fold and Thrust Belt and Tertiary Extension North of Las Vegas Valley. Tectonics 11(6): 1314-1331.

Collins, M. 1996. Wildlife Biologist, U.S. Fish and Wildlife Service. Personal communication.

Cornwall, H. R. 1972. Geology and Mineral Deposits of Southern Nye County, Nevada. Nevada Bureau of Mines and Geology Bulletin 77, University of Nevada, Reno.

Dames and Moore. 1997. Nellis Air Force Range Wetlands Survey Report.

El-Ghonemy, A. A., A. Wallace, and E. M. Romney. 1980. Socioecological and soil-plant studies of the natural vegetation in the northern Mojave Desert-Great Basin Desert interface. *Great Basin Naturalist Memoirs* .

Frampton, K., M. Lucas, and B. Cook. 1993. Modeling Sonic Boom Noise Environment in Military Operations Areas.

Germano, D. J., R. B. Bury, T. C. Esque, T. H. Fritts, and P. A. Medica. 1994. In R. B. Bury and D. J. Germano, eds. *Biology of North American Tortoises*. Pages 73-84. U.S. Department of the Interior, National Biological Survey, Fish and Wildlife Research 13. Washington, D.C.

Hansen, A. J., and F. diCastri (eds.). 1992. *Landscape Boundaries: Consequences for Biotic Diversity and Ecological Flows*. Springer-Verlag, New York, New York.

Harrill, J. R., J. S. Gates, and J. M. Thomas. 1988. *Major ground-water flow systems in the Great Basin region of Nevada, Utah, and adjacent states*. U.S. Geologic Survey, Hydrologic Investigations Atlas HA-694-B.

Hazardous Waste Remedial Action Program (HAZWRAP). 1992. *Preliminary assessment of the Nellis Air Force Range*. U.S. Air Force - Tactical Air Command.

Hubbs, C. L., R. R. Miller, and L. C. Hubbs. 1974. Hydrographic history and relict fishes of the north-central Great Basin. *Memoirs of the California Academy of Sciences*, Volume VII. San Francisco.

Johnston, C. A., J. Pastor, and G. Pinay. 1992. Quantitative Methods for Studying Landscape Boundaries. Pages 107-128 *In:* Hansen, A. J. and F. diCastri (eds.) Landscape Boundaries: Consequences for Biotic Diversity and Ecological Flows. Springer-Verlag. New York, New York.

Lawson, B., and R. Johnson. 1982. Mountain Sheep: *Ovis canadensis* and *O. dalli*, pp. 1036-1055, In V. A. Chapman and G. A. Feldhamer, eds. *Wild Mammals of North America: Biology, Management and Economics.* The Johns Hopkins University Press, Baltimore.

Longwell, C. R., E. H. Pampeyan, B. Bowyer, and R. J. Roberts. 1965. Geology and Mineral Resources of Clark County, Nevada. Nevada Bureau of Mines Bulletin 62, Reno.

Nellis Air Force Base. 1993. Brief History of USAF Weapons and Tactics Center (Air Combat Command) and Nellis Air Force Base, Nevada.

Nellis Air Force Base. 1997. *An inventory for rare, threatened, endangered, and endemic plants and unique communities on Nellis Air Force Bombing and Gunnery Range, Clark, Lincoln, and Nye Counties, Nevada.* Legacy Resource Management Program Support Agreement FB4852-94200-071. Las Vegas, Nevada.

Nellis Air Force Base. 1997. Final Floodplain Inventory Report.

Nellis Air Force Base. 1999. Renewal of the Nellis Air Force Range Land Withdrawal. Department of the Air Force Legislative Environmental Impact Statement.

Nellis Air Force Base. 1999a. Final Environmental Impact Statement Covering the Proposed F-22 Aircraft Development Evaluation and Weapons School Beddown.

Nellis Air Force Base. 2002. Environmental Baseline Survey Water Wells Annex. NAFB, Nevada.

Nellis Air Force Base. 2002a. Environmental Baseline Study Dunning Circle Housing Area. NAFB, Nevada.

Nellis Air Force Base. 2004. Desert Tortoise Survey for Area III at NAFB, Nevada.

Nellis Air Force Base. 2006. 2005 Small Mammal Trapping Report for the North Range of the Nevada Test and Training Range. Nellis Air Force Base, Nevada.

Nevada Bureau of Mines and Geology (NBMG). 1997. Mineral and Energy Resource Assessment of the Nellis Air Force Range, Volumes 1 and 2.

Page, J.A., B.D. Schantz, R. Brown, K.J. Plotkin, and C.L. Moulton. 1994. Measurements of Sonic Booms due to ACM Training in R2301 W of the Barry Goldwater Air Force Range. Wyle Research Report WR 94-11.

Paher, S. W. 1971. Las Vegas: As it Began - As it Grew. Nevada Publications, Las Vegas.

Plotkin, K.J., V.R. Desai, C.L. Moulton, M.J. Lucas, and R. Brown. 1989. Measurements of Sonic Booms due to ACM Training at White Sands Missile Range. Wyle Research Report WR 89-18.

Plotkin, K.J., C.L. Moulton, V.R. Desai, and M.J. Lucas. 1992. Sonic Boom Environment under a Super Sonic Military Operations Area. Journal of Aircraft 29(6): 1069-1072.

Plotkin, K.J. 1996. Sonic Boom Prediction Model: Version1.0c. Wyle Research Report WR 95-22C. May.

Prudic, D. E. 1993. *Conceptual Evaluation of Regional Ground-Water Flow in the Carbonate-Rock Province of the Great Basin, Nevada, Utah, and Adjacent States.* U.S. Geological Survey Open-File Report 93-170.

Public Law 106-65. October 5, 1999. Military Land Withdrawal.

Roe, J. 1998. Nellis Air Force Base Environmental Management Directorate, Restoration Division. Personal communication.

Rundel, P. W., and P. Gibson. 1996. *Ecological Communities and Processes in a Mojave Desert Ecosystem.* Cambridge University Press, Cambridge, Massachusetts.

Science Applications International Corporation and Desert Research Institute (SAIC/DRI). 1989. Special Nevada Report – Evaluation of Cumulative Effects on the Environment and Population.

Science Applications International Corporation. 1999. Final Report: Range Condition Survey and Appropriate Management Level of Wild Horses on the Nevada Wild Horse Range, Nye County, Nevada.

Shreve, F. 1942. The Desert Vegetation of North America. *Botanical Review* 8(4):195-246.

Sierra Delta Corporation. 1991. Transect Data: Biological Assessment for the Mojave Desert Tortoise. NAFB, Nevada.

Spaulding, W. G. 1985. *Vegetation and Climates of the Last 45,000 Years in the Vicinity of the Nevada Test Site, South-Central Nevada*. U. S. Geological Survey Professional Paper 1329. Denver, CO.

Spaulding, W. G. 1990. Vegetational and Climatic Development of the Mojave Desert: The Last Glacial Maximum to the Present. In *Packrat Middens: The Last 40,000 Years of Biotic Change*, edited by J. L. Betancourt, P. S. Martin, and T. R. Van Devender, pp. 166-199. University of Arizona Press, Tucson.

Thompson, T. C. and R. Chappell. 1984. *Maps showing distribution of dissolved solids and dominant chemical type in groundwater, Basin and Range Province, Nevada*. U.S. Geologic Survey, Water-Resources Investigations Report 84-4119-C.

Trulio, L.A. 1995. Burrowing owls thrive in artificial habitat (California). *Restoration and Management Notes*, 13(2): 238-239.

U.S. Army Corps of Engineers, Omaha District. 2001. Environmental Assessment: Live Ordnance Departure Area (LODA) at Nellis Air Force Base. Prepared for Environmental Management Office, NAFB, Nevada.

United States Air Force (USAF). 1985. Draft Environmental Impact Statement. Groom Mountain Range, Lincoln County, Nevada. Nellis Air Force Base, Nevada.

U.S. Dept. of the Interior, Bureau of Land Management, Nevada State Office. 2004. *Nevada Test & Training Range Resource Management Plan and Environmental Impact Statement*.

U.S. Dept. of the Interior, Bureau of Land Management, Nevada State Office. 2004a. Record of Decision for the *Nevada Test & Training Range Resource Management Plan and Environmental Impact Statement*.

Vasek, F. G., and M. G. Barbour. 1977. Mojave Desert scrub vegetation. Pages 835-867 *In:* M. G. Barbour and J. Major (eds.) *Terrestrial Vegetation of California*. John Wiley and Sons, New York.

Wetlands Training Institute, Inc. 1995. *Field Guide for Wetland Delineation: 1987 Corps of Engineers Manual.* WTI 95-3. Poolesville, Maryland.

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